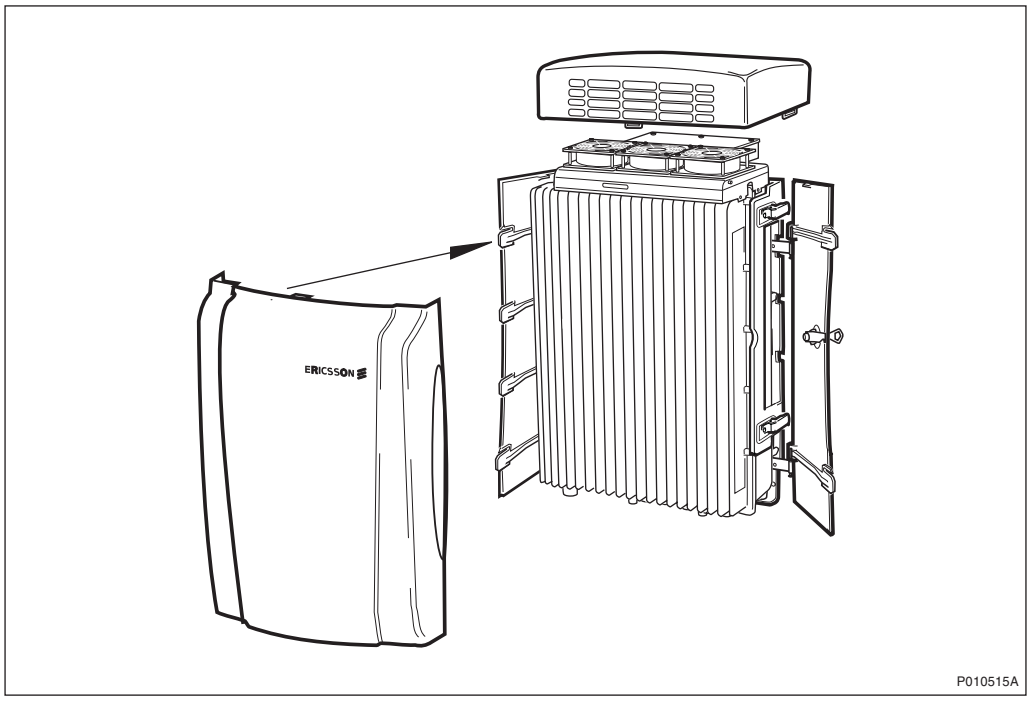


3. Attach the front sunshield to the left sunshield.
4. Close the front sunshield and attach it to the top shield (fan cover or omni antenna) and to the right sunshield.
5. Lock the shield.

5.4.18 Performing Concluding Routines

This section describes the routines to be completed before leaving the site.

Note: Ericsson strongly advises that when cleaning up after installing the RBS, the personnel performing the installation pay particular attention to the environment. Primarily, recycle all waste materials that can be recycled and sort waste so that it can be disposed of according to local regulations.

Table 16 Objects to Be Recycled or Disposed of After RBS Installation

Item	Sort or Recycle?
Cable insulation from crimping, brazing or welding	Sorted with plastics
Packing chips	
Foam	
Polystyrene	
Bubble plastic	
Cable tie clippings	
Paper and wood	Paper recycling
Waste metal from cable ladders	Recycled or sorted as metals
Pieces of cable	
Nuts, bolts, washers and screws	

Note: All packing material should be recycled, and shock absorbers disposed of, in accordance with local recycling regulations.

5.4.18.1 Updating the Site Installation Documentation

1. Check the *Site Installation Documentation* for deviations from the installation.
2. Update the documents with the changes that apply.
3. Send the documents to the person responsible for Site Installation Engineering.

5.4.18.2 Performing Final Checks

Before leaving the site, make sure that the following tasks have been completed:

Table 17 Checklist

Check the following:		OK
1.	All cables are properly routed and connected.	
2.	All sunshields are properly installed.	
3.	The site is clear of waste materials.	
4.	The Site Installation Documentation is updated.	
5.	The modified Site Installation Documentation has been handed over to the person responsible for the site.	
6.	The RBS is powered up if the surrounding temperature changes between hot and cold and the RBS installation is not completed within 48 hours.(1)	

(1) See Chapter Site Installation Tests.

5.5 Installing Mixed Micro Configurations

5.5.1 General

Mixed micro means that an existing RBS 2302 site is expanded by adding one or more RBS 2308s or RBS 2309s. In all mixed micro configurations, the RBS 2308 or RBS 2309 must serve as the master.

A maximum of two RBS 2302 cabinets can be connected to an RBS 2308 or RBS 2309. In an existing configuration of six TRXs, one RBS 2302 cabinet must be removed. The two remaining TRXs of TRX 0 – 5 in the RBS 2302 group will change their numbering to 8 – 11. *See figures below.*

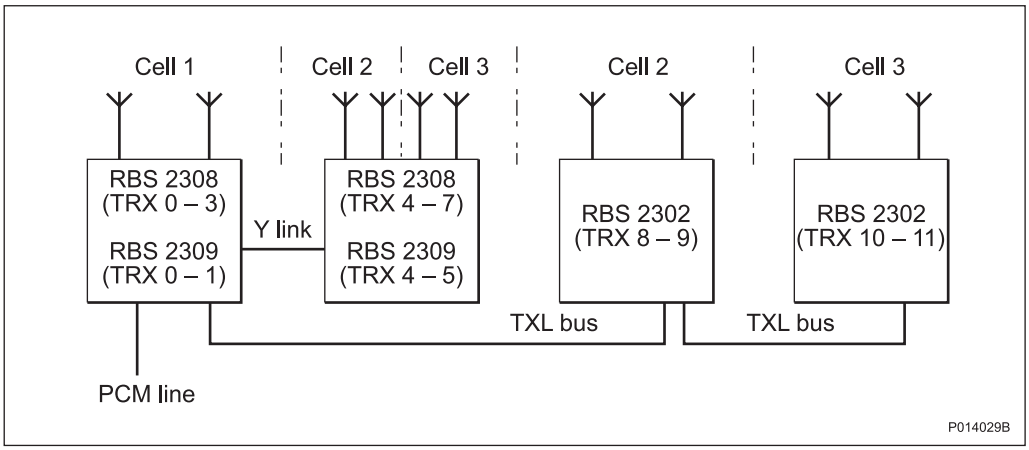


Figure 33 3×4 Configuration with EDGE Capability in All Cells

EDGE capability is only available in the RBS 2308 and RBS 2309. One RBS must be split between two cells for EDGE capability to be available in all cells.

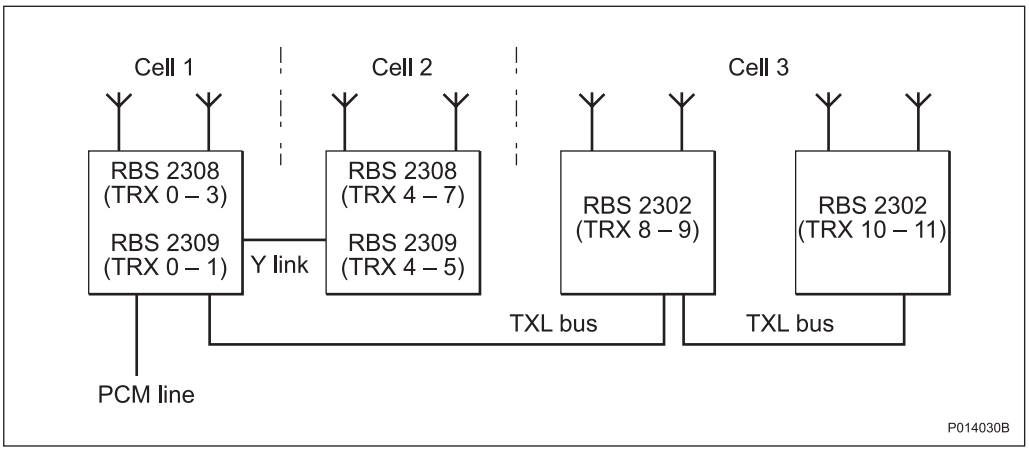


Figure 34 3×4 Configuration with EDGE Capability in Cell 1 and Cell 2

5.5.2 Installation

1. Ensure that the conditions in *Section 5.2 Preconditions on page 41* are fulfilled.

2. Install RBS 2308 or RBS 2309 cabinets according to *Section 5.4 Installation Procedure on page 43*.

3. Connect the TXL bus to the RBS 2302 to be expanded. *See section Connecting the 4- or 6-TRX Cable (Optional)* in:

   RBS 2302 User's Guide *EN/LZT 720 0062*

Note: When upgrading from an RBS 2302 configuration to a mixed micro configuration, site-specific data (for example external alarms) can be reused from an old IDB when creating a new IDB.

6 Antenna System Tests

This chapter describes the tests, Distance To Fault (DTF) and Standing Wave Ratio (SWR), used to verify the antenna system installation. The tests also include measuring the feeder length to calculate feeder system loss and delay.

The tests described are valid for GSM 800/900/1800/1900 passive antenna systems for RBS 2308 and RBS 2309.

Equipment for Antenna System Tests

The Anritsu Site Master S331C is recommended for the tests described in this chapter.

The following Site Master models can be used, if available:

- S120A for GSM 800/900
- S235A for GSM 1800/1900
- S251A/B for GSM 800/900/1800/1900
- S331A/B for GSM 800/900/1800/1900

Note: Instructions for these older instruments are not included in this manual.

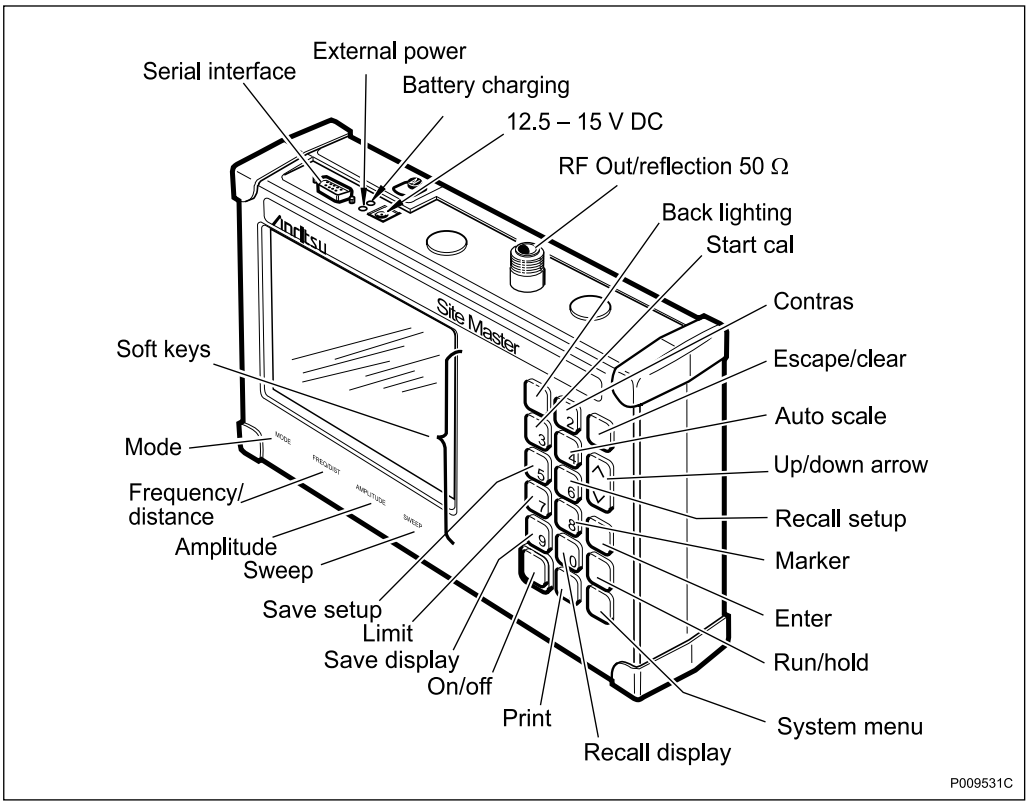


Figure 35 Anritsu Site Master S331C

The keys mentioned in the instructions in this chapter are shown in the figure above. In the instructions a "key" is marked with the text describing its function, while a "soft key" has its text displayed on the screen (next to the key).

For more detailed information on the Antritsu Site Master, *see*:

Anritsu Site Master User's Guide

Preconditions

Before starting the tests, ensure the following:

- For the DTF Tests, that the installation of feeder cables with jumpers is complete prior to testing
- For the SWR Test, that the connection of antennas and feeder cables with jumpers is complete prior to testing. It is recommended not to cover the connectors with sealing tape until all testing is complete.
- A test record for recording the test results is available

Work Process for Antenna System Tests

This section describes the order in which to perform the tests. When the exit criteria for each procedure are fulfilled, the tester enters the results in the test record, then returns to the work process for the next step.

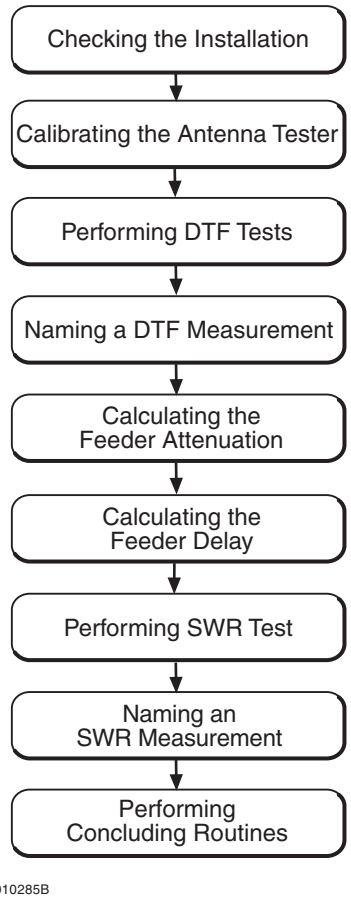


Figure 36 Work Process for Antenna System Tests

The work order can be altered or tests can be removed due to local circumstances. In this event, an investigation of the consequences must be carried out. If the work order is changed or tests are removed, then the department responsible for this manual must be notified and agree to changes, or the responsibility is automatically transferred to the person making the decision.

6.1 Checking the Installation

This section describes how to check that the antenna system installation is correct.

1. Verify that the installation is installed in accordance with the *Site Installation Documentation.*
2. Check that all cables or connectors are free of damage, and that all cables (feeders and jumpers) are properly marked.
3. Check that all connectors are properly connected and tightened.
4. Check that the bend radius specification of all feeders and jumpers has not been exceeded.
5. Verify the antenna directions against the *Site Installation Documentation.* Consider magnetic influences from nearby metallic objects and deviations from magnetic north when using the compass.
6. Check that the correct cable is connected to the correct antenna.
7. Record remarks, if any, in the test record and forward them to the person responsible for the site installation.

6.2 Calibrating the Antenna Tester

This section describes how to calibrate the Site Master, to achieve accurate Test results and to compensate for Test Port Extension Cables.

The calibration includes selecting and setting the frequency range before the calibration, performing the calibration and entering the cable parameters in the Site Master.

Note: The Site Master must be calibrated each time the frequency range is changed.

The Site Master also needs to be calibrated if one of the following messages is shown in the display: "CAL OFF" or "↑°C".

6.2.1 Selecting Frequency Range

This section describes how to select and set the correct frequency range in the Site Master.

1. Press the **FREQ/DIST key**.
2. Press the **F1** soft key.
3. Enter the ***Start frequency*** in MHz, from the table below. Press **ENTER**.
4. Press the **F2** soft key.
5. Enter the ***Stop frequency*** in MHz, from the table below. Press **ENTER**.
6. Check that the FREQ (MHz) scale in the display area indicates the correct frequency start and stop values.

Table 18 Start and Stop Frequencies

System	Start Freq. (MHz)	Stop Freq. (MHz)
GSM 800	800	1000
GSM 900	800	1000
GSM 1800	1700	1900
GSM 1900	1800	2000

6.2.2 Performing Calibration

This section describes how to perform the calibration of the Site Master.

To calibrate the Site Master, a Precision Open/Short/Load is needed; this is shown in the figure below.

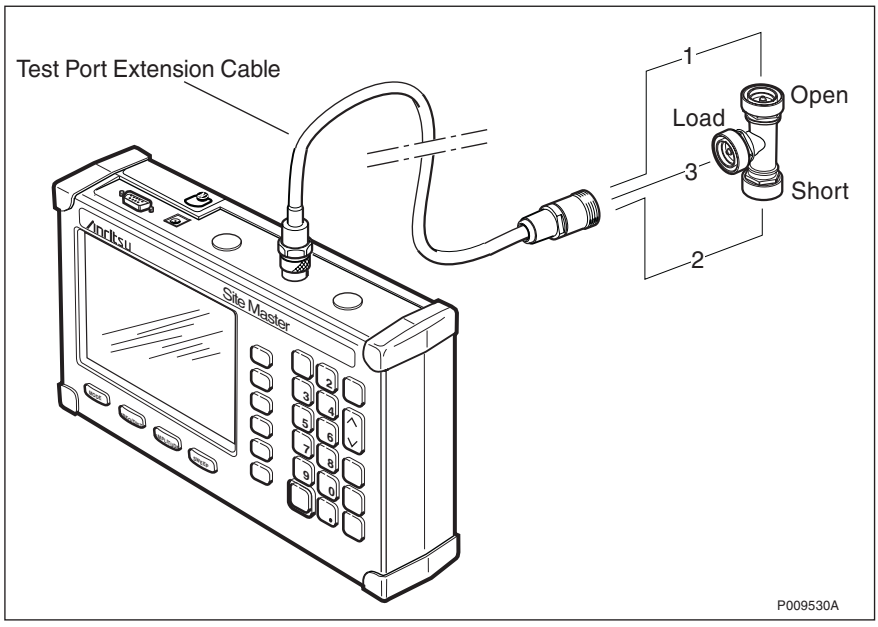


Figure 37 Connecting the Open/Short/Load

For correct calibration results, ensure that the Open/Short/Load is connected at the end of the Test Port Extension Cable, at the same point where the test object is to be connected.

1. Connect the Test Port Extension cable.
2. Ensure that the correct frequency range is selected.
3. Press the **START CAL** key.
4. Connect the "Open" and press **ENTER**. Wait for the measurement to be completed.

5. Repeat step 4 for "Short" and "Load" according to the step-by-step instructions on the screen.

6. When the calibration is complete, disconnect the calibration equipment from the Test Port Extension Cable.

After the calibration, the display shows "CAL ON" as long as the calibration is valid.

6.2.3 Entering Cable Parameters

To achieve accurate DTF test results, the correct cable parameters, velocity factor, and attenuation (dB/m) for the feeder type must be entered.

1. Press the **MODE** key and select "DTF-SWR" by using the **Up/Down arrow** key. Press **ENTER**.

2. Press the **DTF-AID** soft key.

3. Use the **Up/Down arrow** key to select "CABLE LOSS". Press **ENTER**.

4. Enter the ***cable loss*** in dB per metre for the type of feeder being tested, from the table below. Press **ENTER**.

5. Use the **Up/Down arrow** key to select "PROP VEL". Press **ENTER**.

6. Enter the ***relative velocity*** for the type of feeder being tested, from the table below. Press **ENTER**.

Table 19 Velocity Factor and Attenuation for Different Cables

Feeder Type Andrew	**Velocity Factor (PROP VEL)**	**Attenuation, dB/m (CABLE LOSS)**			
		GSM 800	**GSM 900**	**GSM 1800**	**GSM 1900**
1/4-in. LDF1	0.86	0.124	0.129	0.189	0.195
1/4-in. FSJ1 (flex)	0.84	0.179	0.186	0.270	0.278
3/8-in. LDF2	0.88	0.106	0.110	0.161	0.166

Feeder Type Andrew	Velocity Factor (PROP VEL)	Attenuation, dB/m (CABLE LOSS)			
		GSM 800	GSM 900	GSM 1800	GSM 1900
3/8-in. FSJ2 (flex)	0.83	0.121	0.127	0.185	0.191
1/2-in. LDF4	0.88	0.066	0.069	0.101	0.104
1/2–in. FSJ4 (flex)	0.81	0.107	0.112	0.166	0.171
7/8-in. LDF5	0.89	0.037	0.039	0.058	0.060
1 1/4-in. LDF6	0.89	0.027	0.028	0.042	0.043
1 5/8-in. LDF7	0.88	0.022	0.023	0.035	0.036

Note: If the cable type is not found in the table above, the values must be taken from the manufacturer's specifications.

6.3 Performing DTF Tests

The purpose of the Distance To Fault (DTF) test is to verify that there are no bad connections or other faults (for example sharp bends) in the feeder system. It also measures the length of the feeder system to be used in the feeder attenuation calculation.

It is recommended to perform the DTF tests during the installation phase, before the antennas are connected.

6.3.1 Connecting DTF Test Setup

This section contains test setups and information about how to connect the test equipment for the DTF tests.

1. Connect the 50 standard load to the antenna connector of the feeder. *See figure below.*

2. Connect the test equipment to the RBS jumper. *See figure below*.

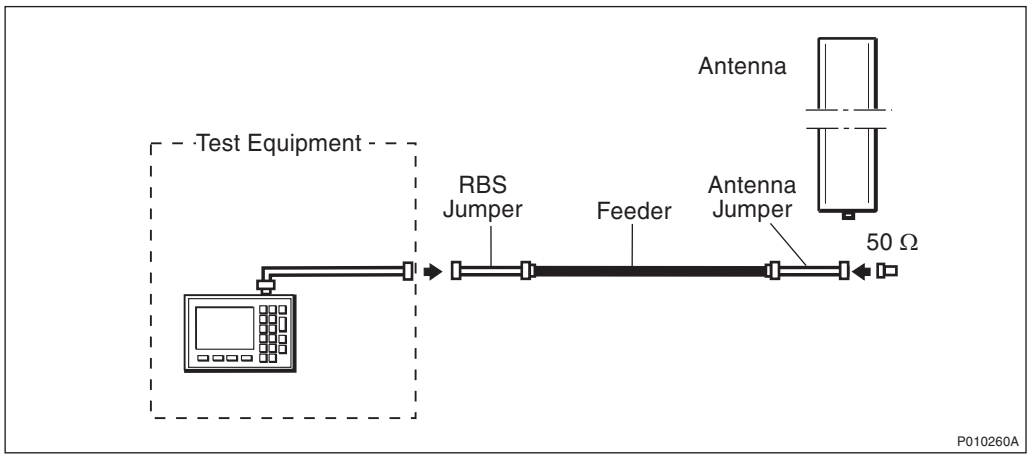


Figure 38 DTF Test Setup

3. Check that all connections are properly connected and tightened.

6.3.2 Testing Feeder Installation

1. Check that the Site Masters display shows "CAL ON", indicating that the Site Master is calibrated. If the display shows "CAL OFF", calibrate the Site Master according to *Section 6.2 Calibrating the Antenna Tester on page 90.*

2. Ensure that the test equipment is connected according to *Section 6.3.1 Connecting DTF Test Setup on page 93.*

3. Press the FREQ/DIST key to set the frequency.

4. Press the **D1** soft key, enter the desired ***start value*** (usually 0.0 m) and press **ENTER**.

5. Press the **D2** soft key, enter the desired ***stop value*** (usually a slight overestimation of the total length of the feeder system) and press **ENTER**.

6. Press the **AMPLITUDE** key to set the scale.

7. Press the **TOP** soft key, enter **1.2** and press **ENTER**.

8. Press the **LIMIT EDIT** soft key and enter **1.05**. Press **ENTER**.

   Note: Ensure that Limit is ON by pressing the **LIMIT ON/OFF** soft key.

9. Wait while the Site Master is calculating (6 to 22 seconds depending on selected display resolution).

10. Observe the waveform. Examples of acceptable and unacceptable DTF measurement results are shown in the figures below.

11. Check that no reflections are above 1.05 SWR (31.5 dB Return Loss). *See Table 24 on page 107,* if necessary.

Example of an Acceptable DTF Measurement

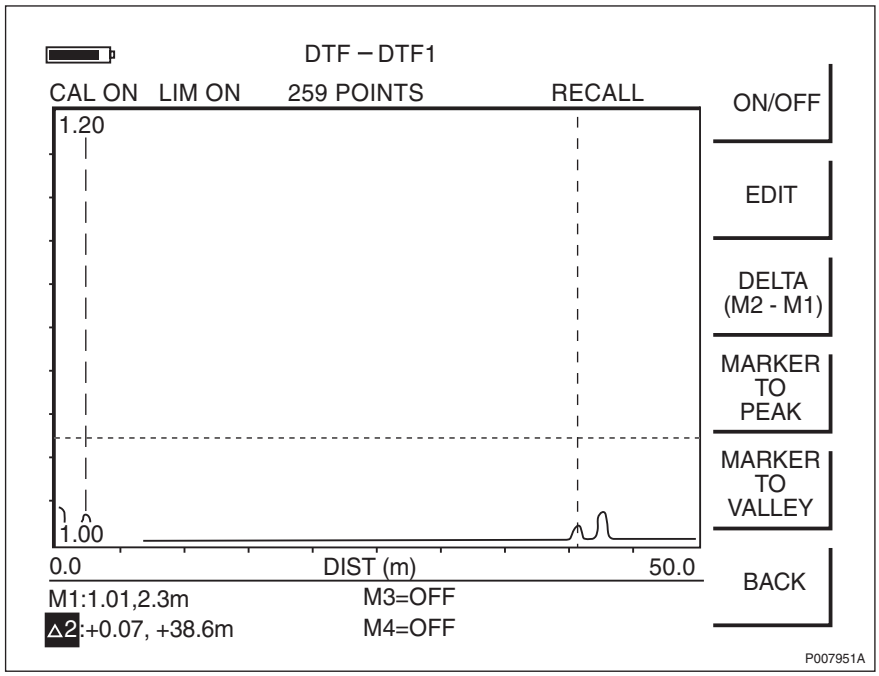


Figure 39 Example of an Acceptable DTF Measurement

Example of an Unacceptable DTF Measurement

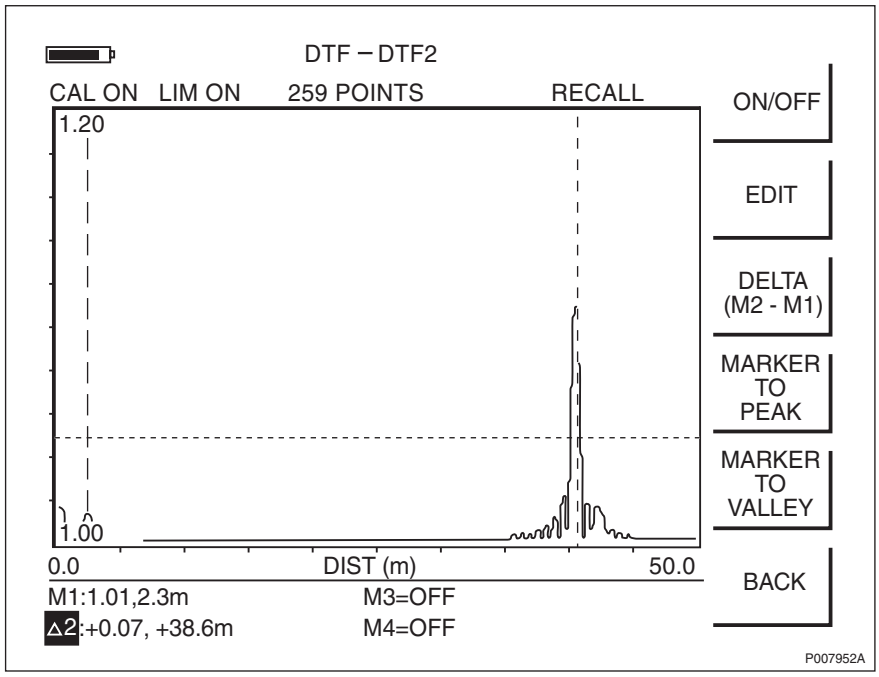


Figure 40 Example of an Unacceptable DTF Measurement

6.3.3 Measuring Feeder Length

This section describes how to measure the feeder length, based on the result of the test in chapter Section 6.3.2 Testing Feeder Installation on page 94.

1. Press the **MARKER** key.
2. Press the **M1** soft key.
3. Press the **EDIT** soft key and place the M1 marker at the near end of the feeder using the **UP/DOWN arrow** key. *See figure below*.

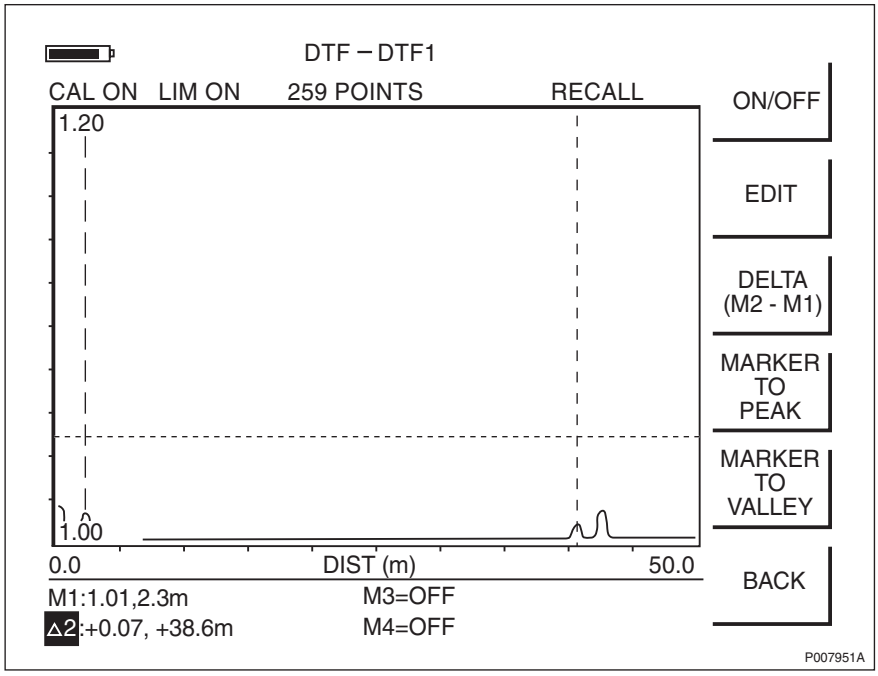


Figure 41 Placing the M1 and M2 Markers

4. Press the **BACK** soft key and then the **M2** soft key.
5. Press the **EDIT** soft key and place the M2 marker at the far end of the feeder, using the **UP/DOWN arrow** key. *See figure above*.
6. Press the **DELTA (M2–M1)** soft key and enter the *Δ2* value as the feeder length in the test record.
7. Create a unique trace name according to *Section 6.4 Naming a DTF Measurement on page 96*. Save the measurement by pressing the **SAVE DISPLAY** key. Type in the trace name using the alphanumeric soft keys, and press **ENTER**.

6.4 Naming a DTF Measurement

This section describes how to give the measurement a unique name that is traceable to a specific antenna system on a specific site.

1. Find the cell ID in the *Site Installation Documentation*.
2. Read the label text on the jumper being measured.
3. Combine the measurement type, cell ID and label text (a unique name with a maximum of 16 characters).

The following example illustrates these steps:

1. The cell ID found in the *Site Installation Documentation* is "SOF007_A".
2. The text on the feeder label is "Cell A: DX1".
3. The type of measurement is DTF, so the name of the measurement is "DTFSOF007ADX1".

Example 1 Naming a DTF Measurement

6.5 Calculating the Feeder Attenuation

This section describes how to calculate the attenuation of the feeder system.

1. Use the feeder length measured in *Section 6.3.3 Measuring Feeder Length on page 96.*
2. Find the attenuation value (dB/m) for the cable type in the table below. Calculate the total attenuation for each feeder and jumper, by multiplying the length in meters by the attenuation per meter.
3. Add the attenuations for the feeder and the jumpers, *see Table 20 on page 98.*
4. Enter the **result** of the calculation in the test record.
5. Repeat the DTF test, and calculate the feeder attenuation for all antenna feeders on the site.

Table 20 Attenuation for Different Cables

Feeder Type Andrew	Attenuation, dB/m (CABLE LOSS)			
	GSM 800	**GSM 900**	**GSM 1800**	**GSM 1900**
1/4-in. LDF1	0.124	0.129	0.189	0.195
1/4-in. FSJ1 (flex)	0.179	0.186	0.270	0.278
3/8-in. LDF2	0.106	0.110	0.161	0.166
3/8-in. FSJ2 (flex)	0.121	0.127	0.185	0.191
1/2-in. LDF4	0.066	0.069	0.101	0.104
1/2-in. FSJ4 (flex)	0.107	0.112	0.166	0.171
7/8-in. LDF5	0.037	0.039	0.058	0.060
1 1/4-in. LDF6	0.027	0.028	0.042	0.043
1 5/8-in. LDF7	0.022	0.023	0.035	0.036

Note: If the cable type is not found in the table above, then the values must be taken from the manufacturer's specifications.

Example of Calculating the Total Feeder Attenuation (GSM 900)

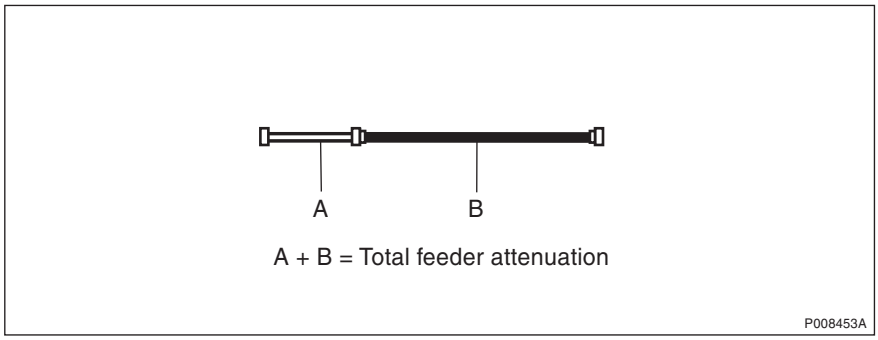


Figure 42 Example of Calculating the Total Feeder Attenuation

```
See figure in this chapter for feeders and jumpers
mentioned in the example.
The frequency band is GSM 900.
The feeder length has been measured at 40 m.

1. Cables used:
   RBS jumper (A):
     Andrew 3/8-in. LDF2
     Length: 2 m
     The attenuation is 0.110 dB/m.
       See the table in this chapter.
     Total cable attenuation for the RBS jumper:
       2 x 0.110 = 0.22 dB

   Feeder (B):
     Andrew 1/2-in. LDF4
     Length: 40 m
     The attenuation is 0.069 dB/m.
       See the table in this chapter.
     Total cable attenuation for the antenna feeder:
       40 x 0.069 = 2.76 dB

2. Total attenuation:
      0.22 + 2.76 = 2.98 dB

3. Enter the results in the test record.
```

Example 2 Calculating the Total Feeder Attenuation

6.6 Calculating the Feeder Delay

This section describes how to calculate the total delay in the feeder system.

1. Use the feeder length measured in *Section 6.3.3 Measuring Feeder Length on page 96*.
2. Find the delay value (ns/m) for the cable type in *Table 21 on page 100*. Calculate the total attenuation for each feeder and jumper, by multiplying the length in metres with the delay per metre.
3. Add the delay for the feeder and the jumpers.
4. Enter the result of the calculation in the test record.
5. Calculate the feeder delay for all antenna feeders.

Table 21 Delay Specifications for Different Cables

Feeder Type Andrew	Delay, ns/m
1/4-in. LDF1	3.9
1/4-in. FSJ1 (flex)	4.0
3/8-in. LDF2	3.8
3/8-in. FSJ2 (flex)	4.0
1/2-in. LDF4	3.8
1/2-in. FSJ4 (flex)	4.1
7/8-in. LDF5	3.7
1 1/4-in. LDF6	3.7
1 5/8-in. LDF7	3.8

Note: If the cable type is not found in the table above, the values must be taken from the manufacturer's specifications.

```
See figure in the previous chapter for feeders and jumpers
mentioned in the example.
The feeder length has been measured at 40 m.

1. Cables used:
   RBS jumper (A):
     Andrew 3/8-in. LDF2
     Length: 2 m
     The delay is 3.8 ns/m.
       See the table in this chapter.
     Delay for antenna jumper:
       2 x 3.8 = 7.6 ns

   Feeder (B):
     Andrew 1/2-in. LDF4
     Length: 40 m
     The delay is 3.8 ns/m.
       See the table in this chapter.
     Feeder delay:
       40 x 3.8 = 152 ns

2. Total delay:
      7.6 + 152 = 159.6 ns   160 ns

3. Enter the results in the test record.
```

Example 3 Calculating the Total Feeder Delay

6.7 Performing SWR Test

The purpose of the Standing Wave Ratio (SWR) test is to verify that the antenna system functions correctly when it is completely installed. The test verifies that the SWR is not too high, and that the signal is not reflected back into the RBS.

6.7.1 Connecting SWR Test Setup

This section describes how to connect the SWR test setup.

1. Connect the test equipment to the RBS jumper, see figure below.
2. Check that all connections are properly connected and tightened.

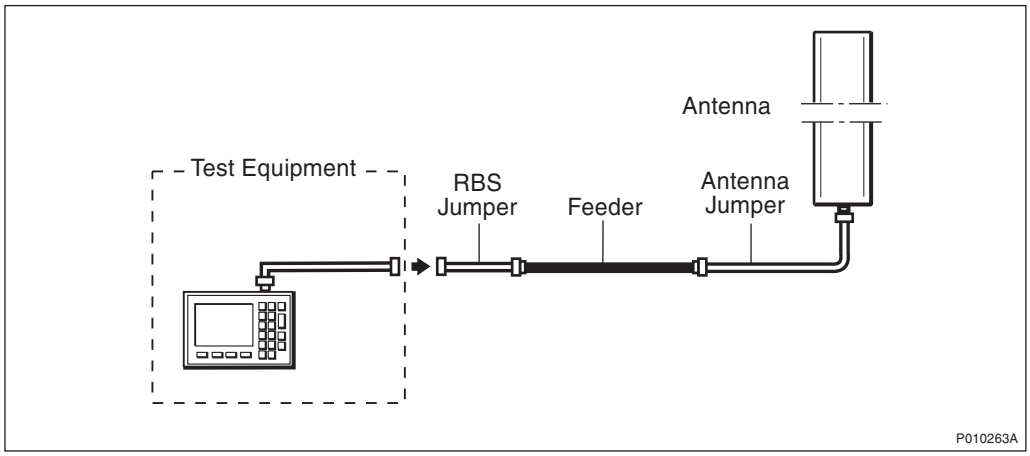


Figure 43 Test Setup

6.7.2 Testing the Antenna System

1. Check that the Site Master's display shows "CAL ON", indicating that the Site Master is calibrated. If the display shows "CAL OFF", calibrate the Site Master according to *Section 6.2 Calibrating the Antenna Tester on page 90*.
2. Ensure that the test equipment is connected according to *Section 6.7.1 on page 101*.
3. Press the **AMPLITUDE** key to set the scale.
4. Press the **TOP** soft key, enter **`2.0`** and press **ENTER**.
5. Press the **LIMIT EDIT** soft key, enter **`1.4`** and press **ENTER**.

   Note: For feeder cables with low loss (below 2 dB), the limit should be set to 1.5.

   Note: Ensure that Limit is in ON-mode by pressing the **LIMIT ON/OFF** soft key.

6. Observe the trace in the frequency range according to the table below.

Table 22 Measurement Frequency Range for Passive Antenna Systems

System	Start Freq. (MHz)	Stop Freq. (MHz)
GSM 800	824	894
E-GSM 900	880	960
P-GSM 900	890	960
GSM 1800	1710	1880
GSM 1900	1850	1990

7. Check that no SWR levels are over 1.4 (= 15.6 dB RL) or 1.5 (= 14 dB RL) for low loss feeders, between the frequencies stated in the table above. For conversion between VSWR and Return Loss *see Table 24 on page 107*. Enter the ***test result*** in the test record. For examples of approved and unapproved waveforms, see figures below.

8. Create a unique trace name in accordance with *Section 6.8 Naming an SWR Measurement on page 103*. Save the measurement by pressing the **SAVE DISPLAY** key. Type in the trace name using the alphanumeric soft keys, and press **ENTER**.

9. Repeat the SWR test for each feeder on the site.

Example of an Acceptable SWR Measurement

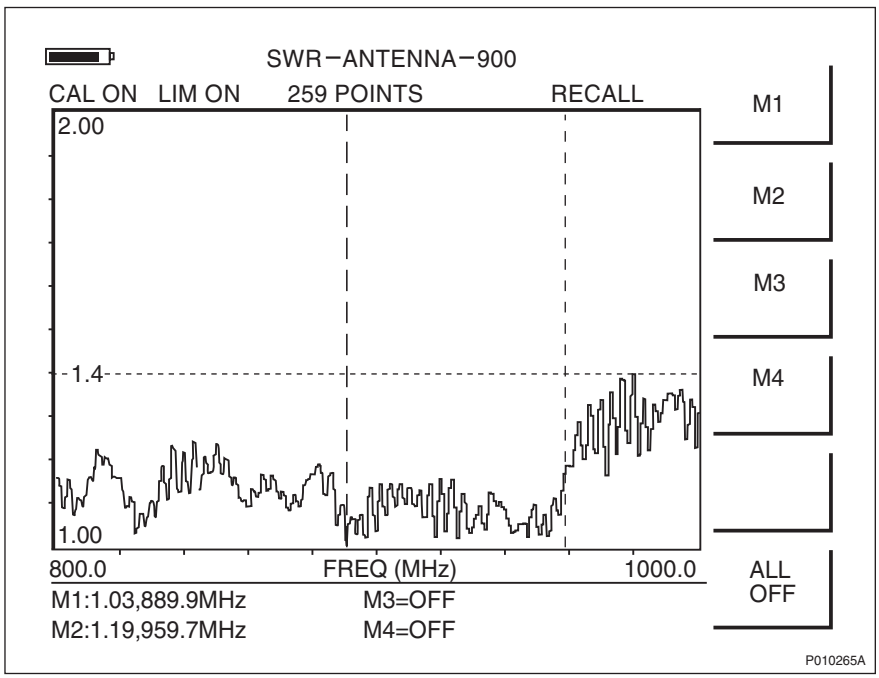


Figure 44 Example of an Acceptable SWR Measurement

Example of an Unacceptable SWR Measurement

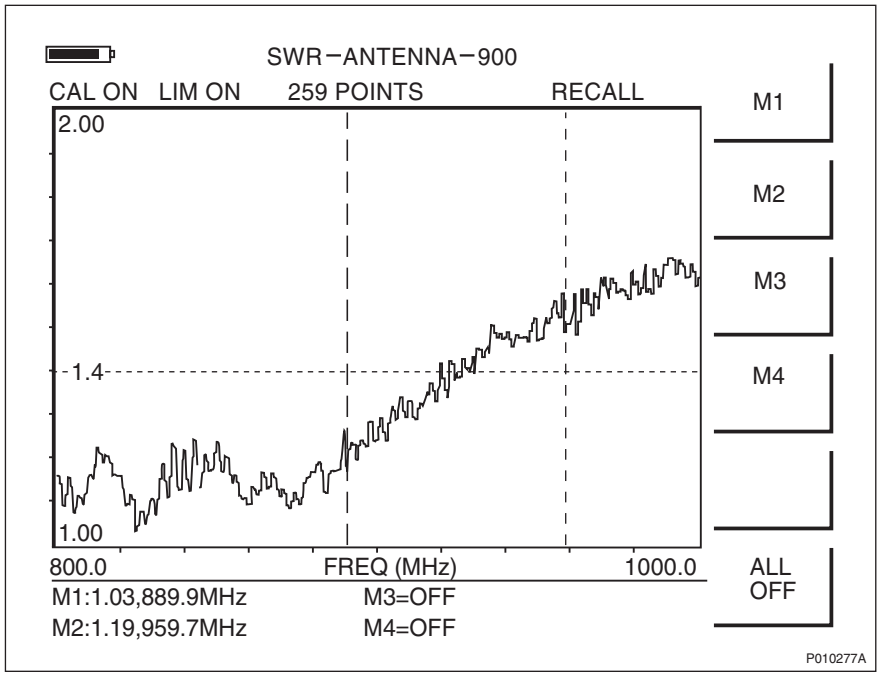


Figure 45 Example of an Unacceptable SWR Measurement

6.8 Naming an SWR Measurement

This section describes how to give the measurement a unique name traceable to the correct antenna system on the correct site.

1. Find the cell ID in the *Site Installation Documentation*.
2. Read the label on the jumper measured.
3. Combine the measurement type, cell ID, and label text (a unique name with a maximum of 16 characters).

The following example illustrates these steps: *Site Installation Documentation*

1. The cell ID found in the *Site Installation Documentation* is "SOF007_A".
2. The text on the feeder label is "Cell A: DX1".
3. The type of measurement is SWR, so the name of the measurement is "SWRSOF007ADX1".

Example 4 Naming an SWR Measurement

6.9 Performing Concluding Routines

This section describes the actions to be taken before leaving the site, and provides a checklist.

6.9.1 Completing Test Record

The form below is to be filled out during site work, and must be completed before leaving the site.

Test Record for Antenna System Tests

Date:	Site Name:
Site No:	RBS Serial No:
Tester's Name:	
Test Instrument: Anritsu Site Master S_____	Serial Number:

Installation Check ☐

DTF Test

Feeder Length

	RRU 0	RRU 1	RRU 2
TX(/RX)1			
TX(/RX)2			
RX1*			
RX2*			

* If applicable

Total Feeder Attenuation

	RRU 0	RRU 1	RRU 2
TX(/RX)1			
TX(/RX)2			
RX1*			
RX2*			

* If applicable

Total Feeder Delay

	RRU 0	RRU 1	RRU 2
TX(/RX)1			
TX(/RX)2			
RX1*			
RX2*			

* If applicable

SWR Test

SWR/Return Loss

	RRU 0	RRU 1	RRU 2
TX(/RX)1			
TX(/RX)2			
RX1*			
RX2*			

* If applicable

Cable Marking: _____

_____

Signatures

Responsible for the Record Date: _____ Name: _____

Customer Acceptance Date: _____ Name: _____

Remarks _____

_____

_____

P012352B

Figure 46 Test Record for Antenna System Tests

6.9.2 Making a Test Record Supplement

The figure below is an example of a printout from the Site Master Software Tools. This should be added as a supplement to the test protocol, and included in the *Site Installation Documentation*.

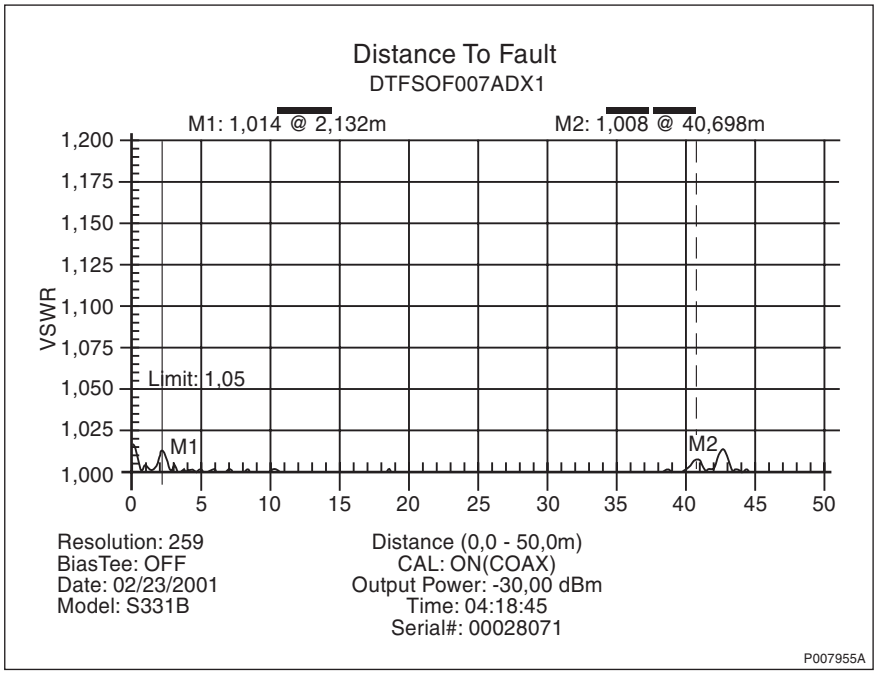


Figure 47 Example of a DTF Measurement Plot

After saving all test results in the Site Master, the test results must be transferred to a PC using the serial cable and the Site Master Software Tools. *See the instructions below*. For further instructions, *see:*

Anritsu Site Master User's Guide

1. Connect the Site Master to the PC's serial port, using the serial cable.
2. Start the Site Master Software Tools on the PC.
3. Click the **Start Plot Capture** button in the Site Master Software Tools.
4. Select the desired plots from the Plots Download dialog box and click **OK**.
5. Save the plots to the PC.
6. Print the plots from the Site Master Software Tools, and insert them in the *Site Installation Documentation*.

6.9.3 Filling in the Checklist

The following checklist is not mandatory but is strongly recommended. Local procedures and safety regulations must be evaluated and included in this checklist.

Table 23 Checklist

Check the following:		OK
1.	That all outdoor antenna system connectors are covered with sealing tape.	
2.	That the test record is filled in.	
3.	That the *Site Installation Documentation* is completed with the test record and the test record supplements.	

6.10 SWR – Return Loss Conversion Table

This section provides the corresponding Standing Wave Ratio (SWR) measurements for a range of Return Loss values, if needed.

Table 24 Conversion Table

Return Loss (dB)	SWR	Return Loss (dB)	SWR	Return Loss (dB)	SWR
4.0	4.42	16.0	1.38	28.0	1.08
6.0	3.01	16.2	1.37	28.5	1.07
8.0	2.32	16.4	1.36	29.0	1.07
10.0	1.92	16.6	1.35	29.5	1.07
10.5	1.85	16.8	1.34	30.0	1.06
11.0	1.79	17.0	1.33	30.5	1.06
11.2	1.76	17.2	1.32	31.0	1.05
11.4	1.74	17.4	1.31	31.5	1.05
11.6	1.71	17.6	1.30	32.0	1.05
11.8	1.69	17.8	1.29	32.5	1.04
12.0	1.67	18.0	1.29	33.0	1.04
12.2	1.65	18.5	1.27	33.5	1.04
12.4	1.63	19.0	1.25	34.0	1.04
12.6	1.61	19.5	1.23	34.5	1.03
12.8	1.59	20.0	1.22	35.0	1.03
13.0	1.58	20.5	1.21	35.5	1.03
13.2	1.56	21.0	1.20	36.0	1.03
13.4	1.54	21.5	1.18	36.5	1.03
13.6	1.53	22.0	1.17	37.0	1.02
13.8	1.51	22.5	1.16	37.5	1.02

Return Loss (dB)	SWR	Return Loss (dB)	SWR	Return Loss (dB)	SWR
14.0	1.50	23.0	1.15	38.0	1.02
14.2	1.48	23.5	1.14	38.5	1.02
14.4	1.47	24.0	1.13	39.0	1.02
14.6	1.46	24.5	1.12	39.5	1.02
14.8	1.44	25.0	1.12	40.0	1.02
15.0	1.43	25.5	1.11	40.5	1.01
15.2	1.42	26.0	1.10	41.0	1.01
15.4	1.41	26.5	1.10	41.5	1.01
15.6	1.40	27.0	1.09	42.0	1.01
15.8	1.39	27.5	1.08	42.5	1.01

7 Site Installation Tests

This section describes the test procedure for site installation tests.

7.1 Preconditions

Before starting the tests, ensure the following:

- A completed test record for Antenna System Tests is available
- The nominal AC mains voltage and/or DC supply on the site is known

Note: The information above can be found in:

Site Installation Documentation

- A test record is available
- Chapters *Personal Health and Safety Information* and *System Safety Information* have been read

7.1.1 Documentation

The list below displays the manual required for site installation tests.

Table 25 Required Manual for Site Installation Tests

Product Name	Description	Product Number
OMT User's Manual	Included in OMT Kit	EN/LZN 720 0001

7.1.2 Before Starting Test Procedure

Before starting the test procedure, ensure the following:

- All personal rings, wrist watches, and other metallic objects are removed before working with the power system
- The necessary tools, instruments, and documentation are available

7.1.3 Work Process for Site Installation Tests

This section describes the order in which to perform the tests. When the exit criteria are fulfilled, the tester should enter the results in the test record, and return to the work process for the next step in the process.

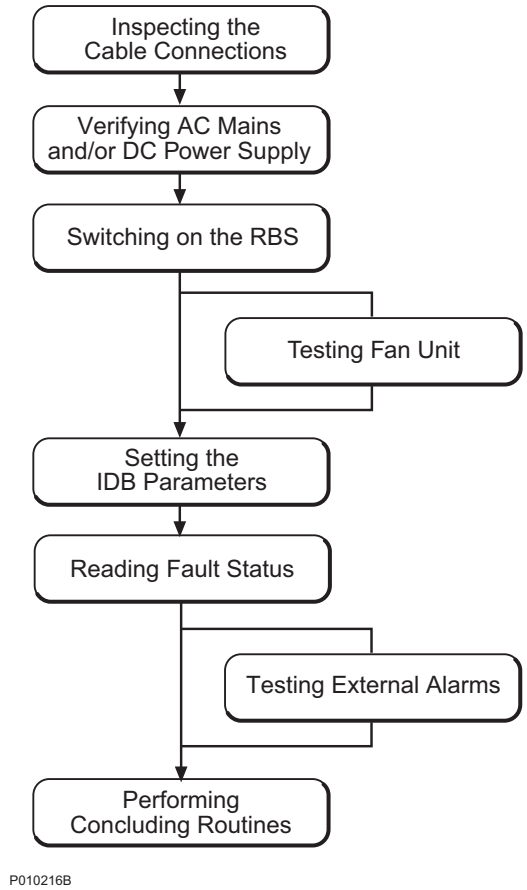


Figure 48 Work Process for Site Installation Tests

The work order can be altered or tests can be removed due to local circumstances, but if this is the case, an investigation of the consequences must be carried out. If the work order is changed or tests are removed, the department responsible for this document must be notified and agree to the changes, or the responsibility is automatically transferred to the person making the decision.

7.2 Inspecting Cable Connections

1. Ensure that all power switches on the MBU are switched off.

2. Check that all cables are properly connected and all connections tightened.

7.3 Verifying AC Mains and DC Power Supply

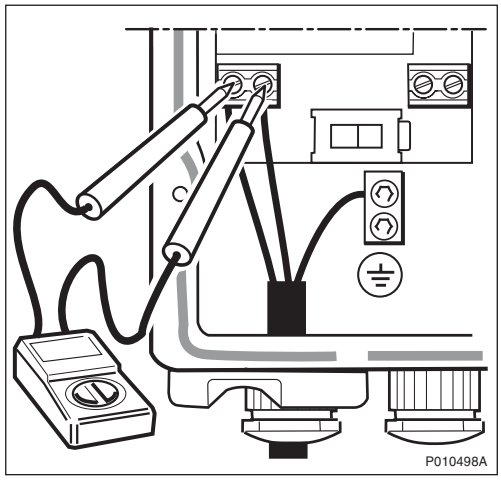
This section describes how to verify that the RBS has the correct incoming AC mains and, where applicable, DC power.

Danger!

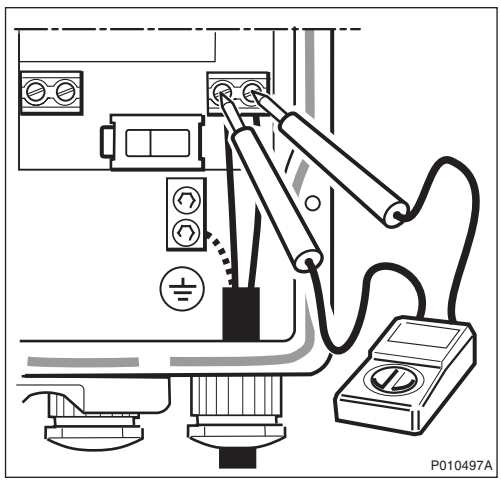
Electric shock risk. Avoid both direct and indirect contact with parts connected to mains power as this is likely to be fatal. Switch off the mains power before starting work.

1 Open the sunshields and the two clasps and pull the RRU to the left side. Remove the lid from the MBU.

2 If applicable, use a multimeter to measure the incoming AC Mains power to the RBS and check that it is between 100 and 127 V AC, or between 200 and 250 V AC.



3 If applicable, use a multimeter to measure the incoming DC power to the RBS and check that it is between −40.5 and −60 V DC.



4 Put back the MBU lid and tighten the screws.

7.4 Switching on the RBS

This section describes how to switch on the RBS.

Note: Do not touch the RBS when any indicators are double-flashing. *See section Double-Flash Indication of Function Changes* in *chapter Maintenance*.

1 Switch on the RBS AC on/off switches on the MBU on all cabinets. Repeat this procedure for the RBS DC on/off and the RRU on/off switches.

2 Before continuing testing of the site installation, ensure that the indicators on the RRU and IXU interface panels have the status shown in the table below when the RBS is in local mode.

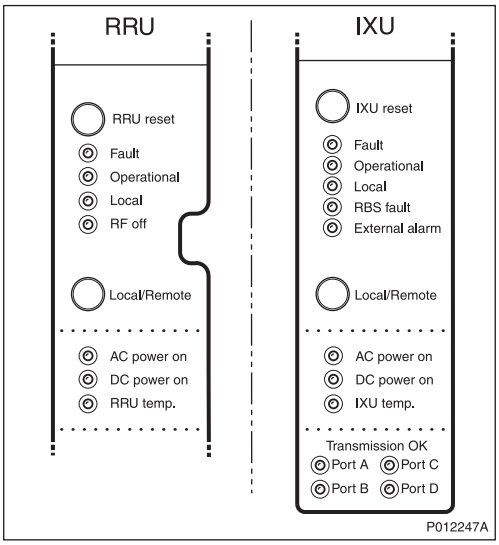


Table 26 RRU Indicators Before Setting the IDB Parameters

RRU Indicator	Status
Fault	Off
Operational	Off
Local	On
RF off	On
AC power on	On(1)
DC power on	On(1)
RRU temp.	Off

(1) Depending on power system configuration.

Table 27 IXU Indicators Before Setting the IDB Parameters

IXU Indicator	Status
Fault	Off
Operational	Off

IXU Indicator	Status
Local	On
RBS fault	Off
External alarm	Off
AC power on	On(1)
DC power on	On(1)
IXU temp.	Off
Transmission OK	On/Off(2)

(1) Depending on power system configuration.

(2) Status, depending on transmission configuration.

Note: In cold conditions, the RBS may need up to 75 minutes to warm up, during which time the IXU or RRU temperature indicator is on. The internal heater works only with AC power supply.

RBS units from certain R-states are less sensitive to low temperatures and have therefore no internal heater. For more information about unit R-states from which these improvements apply, *see chapter Product Description, section Operating Environment* in the following manual:

RBS 2308, RBS 2309, and RBS 2109 Hardware Reference Manual *EN/LZN 720 0058*

3. If the Operational indicator on the RRU and/or IXU is double-flashing, software is being downloaded. If the indicator is flashing, configuration is in progress. Wait until the indicator stops flashing or double-flashing before continuing.

4. If the Local indicator on the IXU is off or flashing, press the **Local/Remote** button to set the IXU in local mode.

7.5 Testing Fan Unit

This section describes how to test the optional fan unit (if applicable).

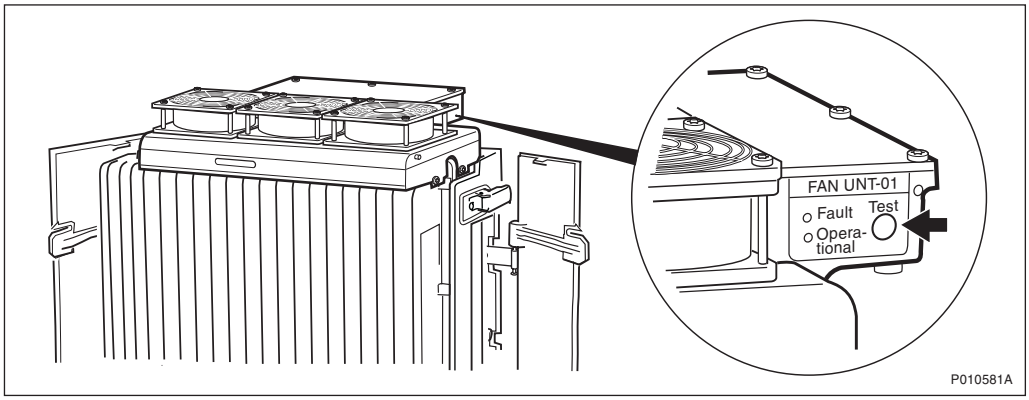


Figure 49 Location of Fan Unit Test Button

1. Remove the fan unit cover.
2. Press the **Test** button on the fan unit.

   The fan unit performs a self test.
3. Check that the sequence below is carried out:

- The fans run at maximum speed for approximately 5 seconds
- The fans run at nominal speed for approximately 5 seconds
- The fans stop within approximately 5 seconds

4. Ensure that the indicator status of the fan unit is in accordance with the table below:

Table 28 Fan Unit Indicators After Test

Fan unit Indicator	Status
Fault	Off
Operational	On

5. Put back the fan unit cover.

7.6 Setting IDB Parameters

This section describes how to set the IDB parameters using the Operation and Maintenance Terminal (OMT).

For more detailed information on the use of the OMT, for example, when to define a parameter, why the parameter should be set, which values are valid, and the consequences of not setting a parameter, *see*:

OMT User's Manual *EN/LZN 720 0001*

Note: For OMT Version R31 and later, the OMT parameters are also included as on-line help.

Work Process for Setting IDB Parameters

This section describes the work process for setting the IDB parameters.

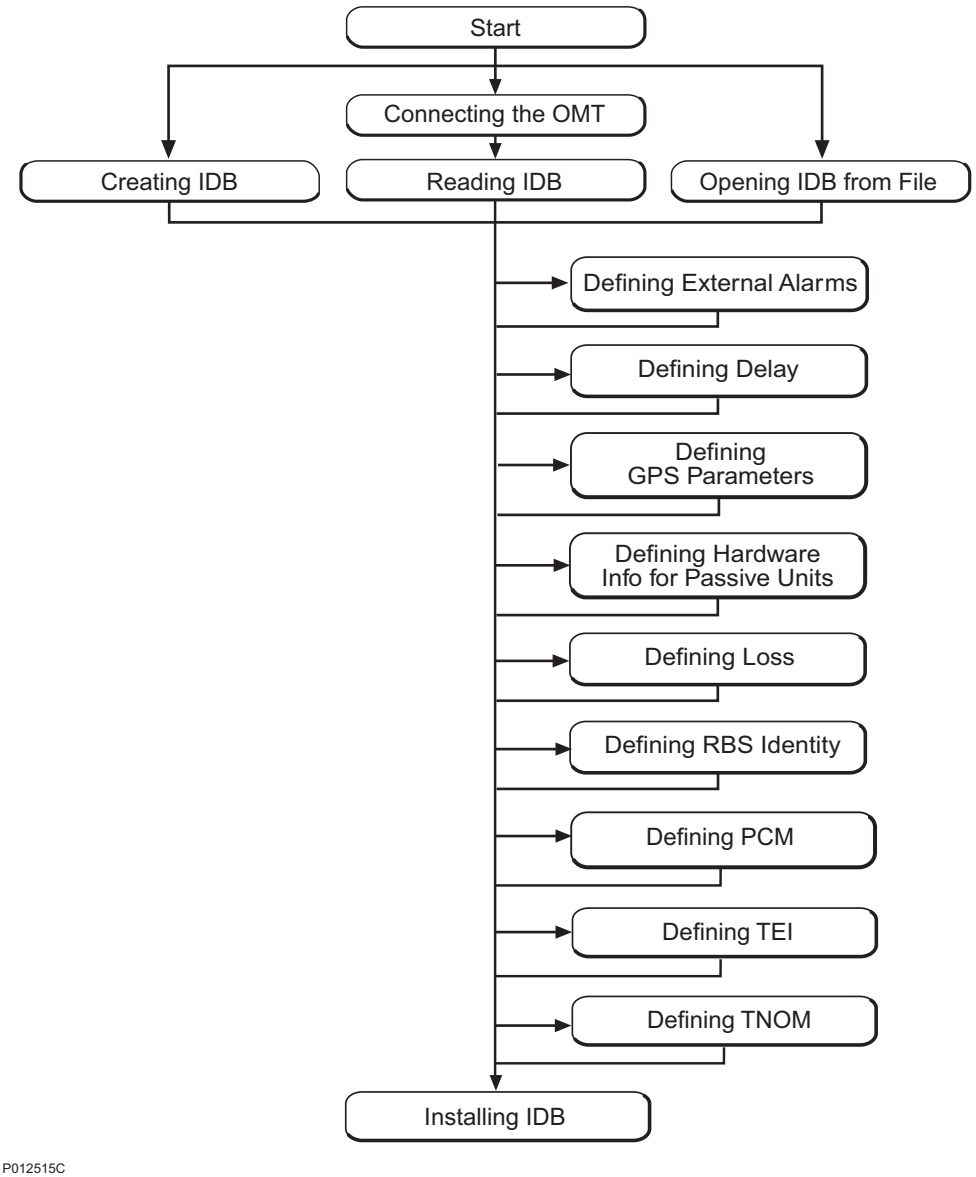


Figure 50 IDB Parameter Setting Work Process

If IP is selected as the transmission interface, then the two OMT dialog boxes Defining PCM and Defining TNOM are not accessible.

Note: The IDB parameter values required are found in:

Site Installation Documentation

7.6.1 Creating IDB

This section describes how to define the configuration setup in the OMT.

Defining Transmission Interface

1. On the **RBS 2000** menu, select **Disconnect** to disconnect the OMT logically from the RBS.
2. On the **Configuration** menu, select **Create IDB** to open the Create IDB window.
3. Select the transmission interface.

Defining Cabinet Setup

1. To add cabinets to the Cabinet Setup box, click **New** to open the Define Setup for Cabinet window.
2. In the Cabinet Type box, select the RBS type:
   – 2308
   – 2309

Note: If IP is selected as the transmission interface, then 2308 is automatically selected in this step and the Define Cabinet Options window is opened.

3. In the Define Cabinet Options window, select the applicable master cabinet configuration and click **OK**:
   – IXU
   – IXU/RRU
4. Select the power system used:
   – 230/115 V AC, no backup
   – 230/115 V AC, external battery
   – −48 V DC
5. If an RRU is present in the cabinet, select the climate system used:
   – Cooling by convection
   – Fan unit

6. Click **OK** when finished.

7. Repeat steps 1 to 6 to add another RRU cabinet to the configuration. Selecting the RBS type according to step 2 and defining the master cabinet according to step 3 are not relevant when adding another RRU cabinet.

Defining Antenna Sector Setup

For different Site Cell Configurations (SCC), the number of cells is related to antenna sectors. The number of TRXs is related to the number of RRUs (antenna systems). The RBS 2308 has four TRX/RRU and RBS 2309 has two TRX/RRU.

Example 1: For an RBS 2309 in a SCC = 1×4, define an RBS with two RRUs (two TRX/RRU) and then define one antenna sector with two antenna systems (RRUs).

Example 2: For an RBS 2308 in a SCC = 3×4, define an RBS with three RRUs (four TRX/RRU) and then define three antenna sectors with one antenna system (RRU).

1. To add antenna systems for an antenna sector, click **New** in the Antenna Sector Setup window.

2. To define an antenna system for a sector, click **New**.

3. In the Frequency box, select the frequency used.

4. In the Duplexer box, select Yes if the RRU internal duplexer is used (duplex mode) and No if not (simplex mode). This selection is only applicable for RBS 2308 configured with 800/1900 RRUs.

5. In the RX Diversity box, select No or 2-Way.

6. Click **OK**.

7. To define another antenna system within the same antenna sector, click **New** again.

8. Click **OK**, or repeat step 7 for adding more RRUs within the same antenna sector.

9. To define an antenna system in a new sector, repeat steps 1 to 8.

10. Click **OK** in the Create IDB window when all antenna sectors are defined.

The Final Configuration Selection window appears.

Selecting Final Configuration

1. In the Final Configuration Selection window, select the SCC.

2. Verify that the correct parameters have been entered. Click **OK**.

3. In the OMT dialog box asking "Do you really want to overwrite the IDB data in the OMT?", click **Yes**.

4. In the OMT dialog box asking "Do you want to re-use data in the previous configuration?", click **Yes** if the IDB is to be modified only, and **No** if a new IDB is to be configured.

7.6.2 Connecting OMT

This section describes how to connect the OMT physically to the RBS.

1. Remove the lid from the OMT port on the IXU.

2. Connect the OMT cable from the PC serial port to the OMT port on the right-hand side of the IXU. If an extended OMT cable is connected to the OMT port, then connect the OMT cable to the end of the extended OMT cable.

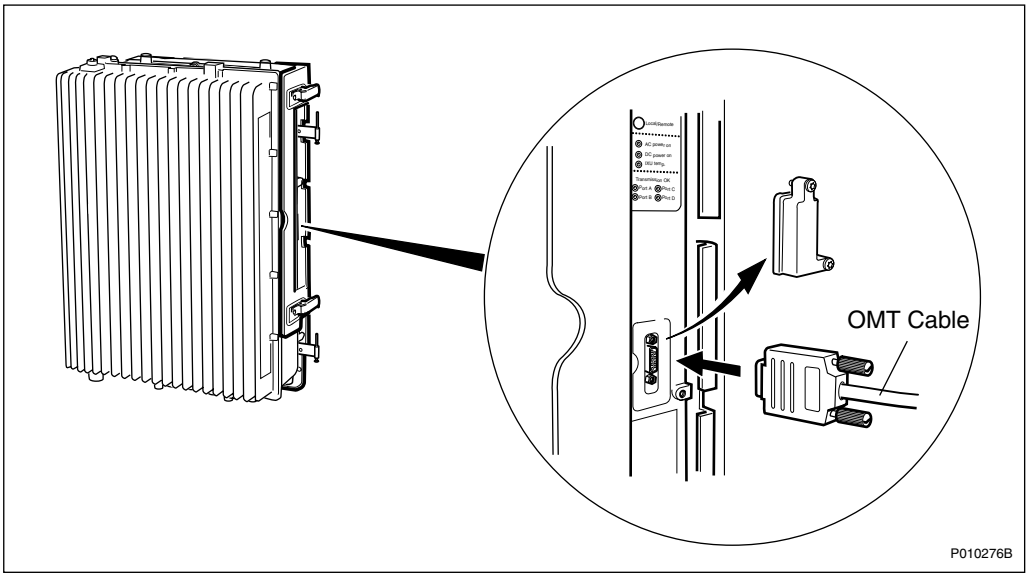


Figure 51 Connecting OMT to IXU

3. Start the OMT.

7.6.3 Reading IDB

This section describes how to read the IDB in the OMT to check if the values of the IDB parameters are correct.

1. On the **RBS 2000** menu, select **Connect** to connect the OMT logically to the RBS.

2. On the **Configuration** menu, select **Read IDB**.

3. On the **Configuration** menu, select **Display** and then **Information** to enter the Display Information window.

4. Select **IDB** and click **Run**. Check the parameters listed in the table below.

Table 29 Reading and Checking IDB

Check that the following parameters are correct:	OK
Transmission interface	
Cabinet configuration(s)	
Antenna sector configuration(s)	

5. If the IDB parameters in the table above need to be set, *see Section 7.6.1 on page 116*.

   If the IDB parameters above are correct, set the following applicable site-specific IDB parameters:

- Alarm inlets (external alarms)
- Delay
- GPS parameters (does not apply to BSS R9 software)
- Hardware information
- Loss
- RBS identity
- Transmission (PCM) parameters
- TEI value for the IXU
- TNOM parameters

6. On the **RBS 2000** menu, select **Disconnect** to disconnect the OMT logically from the RBS.

7.6.4 Opening IDB from File

This section describes how to open a saved IDB file from the disk.

1. Start the OMT.
2. On the **Configuration** menu, select **Open IDB**.
3. Locate and select the saved IDB file to be opened.
4. Click **Open** in the Open IDB dialog box to open the saved IDB file.

7.6.5 Defining External Alarms

This section describes how to define the external alarms, if applicable.

To enable the supervision of devices connected to the external alarm interface of the RBS, several parameters need to be set.

For an overview of the available parameter settings for external alarms, *see table below*.

Table 30 External Alarm Parameters

Parameter	Valid Values	Default	Description
Type	Closing, Breaking	Closing	Specifies how an external device indicates an alarm and must be set to enable correct supervision. A fault is indicated by closing or breaking the sensor loop.
Id	0 – 9, A – F	0	Uniquely identifies the external alarm equipment. The value is sent in external alarm reports to the O&M centre.
Severity	Level 1, Level 2	Level 1	Indicates the severity of the external alarm. The operator determines the values to be used for the alarms.
Comment	Character string with up to 62 characters. Valid characters are: 0..9 A..Z space ! # $ % & ' ( ) * + , - . / : ; < = > ? _	An empty character string	The operator can add a description of the external alarm. The value is sent to the O&M centre in external alarm reports.

1. On the **Configuration** menu, click **Define** and **Alarm Inlets** to open the Define Alarm Inlets window.

2. In the Alarm Inlet Information window, select a physically connected alarm inlet that needs to be defined.

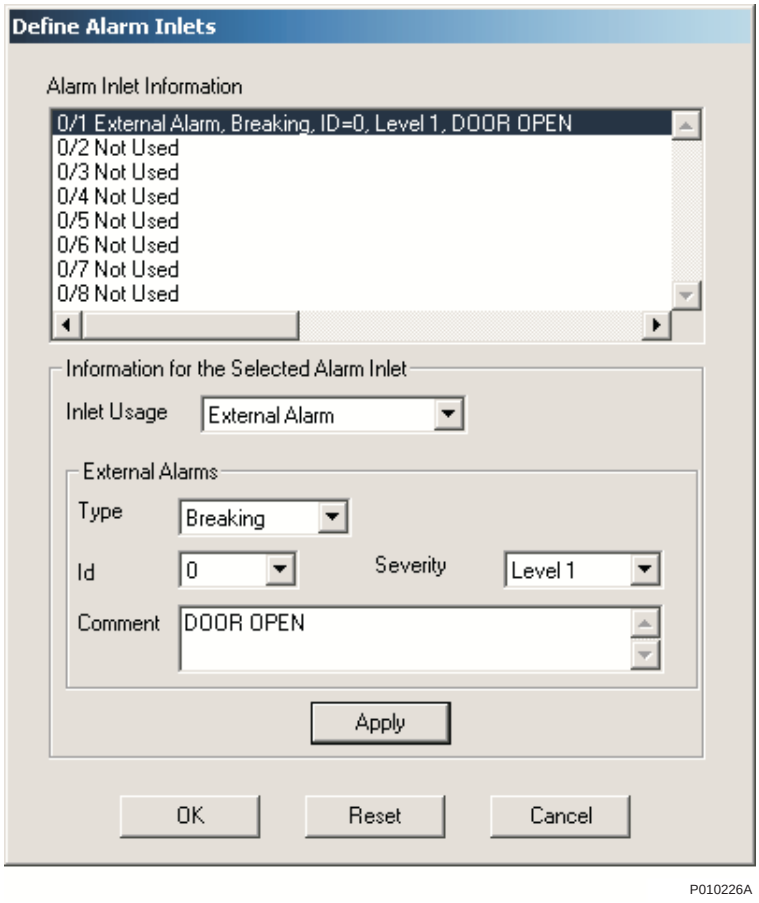


Figure 52 Defining Alarm Inlets

3. In the Inlet Usage box, select "External Alarm".

4. In the Type box, define the alarm type as "Closing" (the alarm is raised when the alarm loop closes) or "Breaking" (the alarm is raised when the alarm loop breaks).

5. In the ID box, give the alarm the appropriate ID number.

6. In the Severity box, set the severity level of the alarm.

7. Add a message in the Comment box.

   This message will be displayed in the BSC/OMT if the alarm is raised.

8. Click **Apply** after defining the alarm.

9. Repeat steps 2 to 8 to define remaining alarms.

10. Click **OK** when all alarms are defined.

Defining External Alarms for EBB, and PBC

The alarms for the External Battery Backup (EBB), and Power and Battery Cabinet (PBC) must be defined according to the tables below.

EBB-01

Table 31 External Alarm Definitions for EBB-01

Alarm Inlet	Inlet Usage	Type	Id	Severity	Comment
0/5	External Alarm	Breaking	(1)	Level 2	Battery backup fault
0/6	External Alarm	Breaking	(1)	Level 2	Battery backup is about to end
0/7	External Alarm	Breaking	(1)	Level 2	Check battery

(1) Preferably, ID should be set to the same number as the corresponding alarm inlet.

EBB-06

Table 32 External Alarm Definitions for EBB-06

Alarm Inlet	Inlet Usage	Type	Id	Severity	Comment
0/4	External Alarm	Breaking	(1)	Level 2	Battery backup fault

(1) Preferably, ID should be set to the same number as the corresponding alarm inlet.

PBC

Table 33 External Alarm Definitions for PBC

Alarm Inlet	Inlet Usage	Type	Id	Severity	Comment
0/4	External Alarm	Breaking	(1)	Level 2	Battery backup fault

(1) Preferably, ID should be set to the same number as the corresponding alarm inlet.

PBC-02

Table 34 External Alarm Definitions for PBC-02

Alarm Inlet	Inlet Usage	Type	Id	Severity	Comment
0/4	External Alarm	Breaking	(1)	Level 2	Battery backup fault

(1) Preferably, ID should be set to the same number as the corresponding alarm inlet.

7.6.6 Defining Delay

This section describes how to define RX and TX feeder delay.

The delay parameter specifies the RF signal delay in the feeder. If the total feeder delay value, measured and calculated in chapter Antenna System Test, differs from the default delay (configuration dependent) then the delay parameter must be updated to the total feeder delay value (0-10,000 ns). *See test record from Antenna System Test*.

1. On the **Configuration** menu, click **Define** and **Delay** to open the Define Delay window.

2. Select the cable for which delay is to be defined, and click **Run**.

3. Enter the delay value (in ns) from the *Test Record for Antenna System Tests*and click **OK**.

4. Repeat steps 2 and 3 for the remaining cables.

5. Click **Close** when finished.

7.6.7 Defining GPS Parameters

This section describes how to set the GPS parameters, if applicable.

Note: These parameters do not apply to BSS R9 software.

To be able to use GPS as a synchronization source, the RBS must be equipped with a GPS receiver.

A GPS receiver is used to achieve a synchronized radio network and works as reference for RF frequency generation and GSM time-based counters.

Parameters for the GPS are set according to the table below.

Table 35 GPS Parameters

Parameter	Valid Values	Default	Description
GPS present	Yes, No	No	The parameter is automatically changed to Yes when GPS receiver hardware is added. If the GPS receiver is removed, the parameter must be manually set to No.
GPS RX delay	0 – 65535 ns	0 ns	The parameter defines the delays in the GPS receiver, antenna, and cables and is important in achieving a synchronized network.
GPS RX DXU delay	0 – 65535 ns	0 ns	The parameter defines the delays from the GPS receiver to the IXU, including delays in the OVP unit and is important in achieving a synchronized network.

Note: If the GPS receiver is used only as a reference for RF frequency generation, then it is not necessary to set the GPS RX delay and GPS RX DXU delay parameters.

1. On the **Configuration** menu, click **Define** and **GPS Parameters** to open the Define GPS Parameters window.
2. Select **Yes** for GPS present.
3. Enter the GPS RX delay (in ns). This is the delay in the GPS antenna, GPS antenna feeder cables and GPS receiver.
4. Enter the GPS RX DXU delay. This is the delay from the GPS receiver to the IXU, including the delay in the OVP and optional EBB.
5. Click **OK** when finished.

7.6.8 Defining Hardware Information for Passive Units

This section describes how to define hardware information for passive units, if applicable. *See Site Installation Documentation.*

The hardware information is defined to make the RBS inventory information, available in the OMT and at the O&M centre, more complete.

Defined hardware information can be displayed, using the OMT functions Display Inventory List and Display Information, or at the O&M centre.

1. On the **Configuration** menu, click **Define** and **Hardware Info** to open the Define HW Info window.
2. Select the applicable HW unit in the list and click **Run**.

3. Enter the hardware information, and click **OK** when finished.
4. Repeat steps 2 to 3 for all applicable HW units.
5. Click **Close** when finished.

7.6.9 Defining Loss

This section describes how to define the Total Feeder Attenuation.

To sustain uplink RX sensitivity and optimize the RF performance of the RBS, it is essential to define the correct value for the loss parameter. That includes losses from jumper cables, combiners, splitters and RF filters of an RX feeder chain with attached TMA.

For a TMA configuration, this means that if the feeder loss value, measured and calculated in chapter Antenna System Test, differs from the default loss value of 3.996 dB, then the loss parameter must be updated to the feeder loss value. *See test record from Antenna System Test.*

For non-TMA configurations, the loss parameter is kept to the default value of 0 dB.

1. On the **Configuration** menu, click **Define** and **Loss** to open the Define Loss window.
2. Select the appropriate feeder cable (for example, FEED_RXA 0) and click **Run**.
3. In the Define Loss window, enter the Total Feeder Attenuation from the test record for Antenna System Tests and click **OK**. The OMT has default values for the RRU to RXBP RX cables.
4. Repeat steps 2 to 3 for each RX and TX feeder used.
5. Close the Define Loss window when finished.

7.6.10 Defining RBS Identity

This section describes how to define the RBS Identity.

Specifying a name and a description for the RBS makes the RBS easier to identify when for example connecting it by Remote OMT.

1. In the **Configuration** menu, select **Define** and **RBS Identity** to open the Define RBS Identity window.
2. In the RBS name field, enter the RBS name (preferably a unique name with a maximum of 20 characters).
3. In the RBS description field, enter information about the site, such as the site name or the location of the site (maximum of 100 characters).
4. Click **OK**.

7.6.11 Defining PCM

This section describes how to define the PCM parameters for transmission.

- For transmission interface E1, 75 Ω, *see Page 126*
- For transmission interface E1, 120 Ω, *see Page 126*
- For transmission interface T1, 100 Ω, *see Page 128*

Transmission Interface E1, 75 Ω

This section describes how to define the PCM parameters for transmission interface E1, 75 Ω.

1. On the **Configuration** menu, click **Define** and **PCM**.
2. Set the parameters according to the table and instructions below.
3. Click **OK** when all parameters are set.

Table 36 PCM Parameter Settings for Transmission Interface E1, 75 Ω

PCM Parameter		**Settings**
Transmission Interface		E1
Network Topology		*See Site Installation Documentation*
Sync Source		*See Site Installation Documentation*
CRC-4		*See Site Installation Documentation*
Spare bits		*See Site Installation Documentation*
Receiver Sensitivity	A	Short haul
	B	Short haul
	C	Short haul
	D	Short haul

Transmission Interface E1, 120 Ω

This section describes how to define the PCM parameters for transmission interface E1, 120 Ω.

Note: Calculating the total attenuation of the entire RBS chain is only necessary if multidrop (in combination with OVPs with bypass relays) is used.

1. On the **Configuration** menu, click **Define** and **PCM**.
2. Set the parameters according to the table and instructions below.
3. Click **OK** when all parameters are set.

Table 37 PCM Parameter Settings for Transmission Interface E1, 120 Ω

PCM Parameter		Settings
Transmission Interface		E1
Network Topology		*See Site Installation Documentation*
Sync Source		*See Site Installation Documentation*
CRC-4		*See Site Installation Documentation*
Spare bits		*See Site Installation Documentation*
Receiver Sensitivity	A	*See instructions below*
	B	
	C	
	D	

The instructions below describe how to calculate the cable attenuation between the Far End and the RBS. The cable attenuation determines whether receiver sensitivity is to be set to short or long haul. Use of long haul requires that the equipment at the far end supports long haul.

Note: Ports C and D can also be used as a multidrop pair.

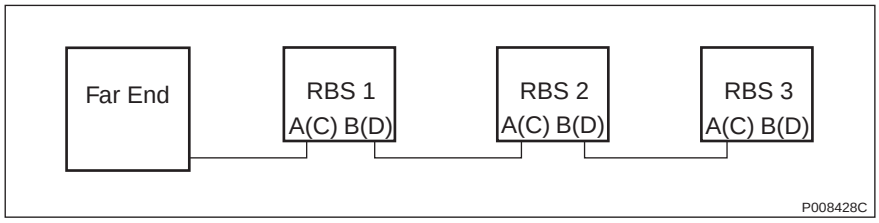


Figure 53 System View for Transmission Interface E1, 120 Ω

1. Calculate the cable attenuation between the Far End and the RBS according to the following formula:

   Cable attenuation = cable length × cable attenuation per metre (or foot).

   If multidrop is used, then calculate the attenuation of the entire RBS chain, because Receiver Sensitivity A (C) is determined by the total attenuation of the chain. Receiver Sensitivity B (D) is determined by the total attenuation to the last RBS in the chain.

2. If the cable attenuation is less than 6 dB, then set the receiver sensitivity to short haul.

   If the cable attenuation is greater than 6 dB, then set the receiver sensitivity to long haul.

3. Set unused ports to short haul.

The following example illustrates what is said above.

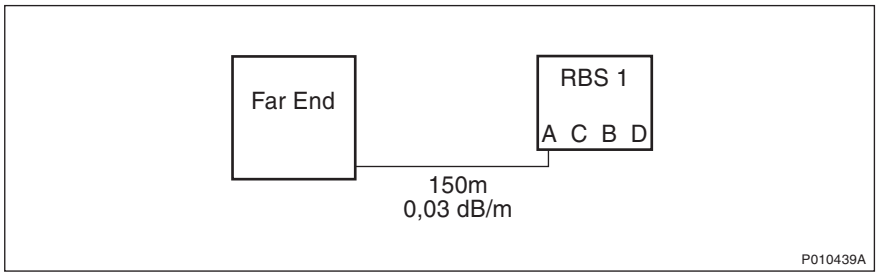


Figure 54 Example of Receiver Sensitivity Parameter Calculation for E1, 120 Ω

In this example, Far End and the RBS refer to the figure above.
The cable length between the RBS and the Far End is 150 m.
The cable attenuation for the cable between the RBS and the Far End is 0.03 dB/m.

1. Calculate the cable attenuation between the Far End and the RBS:
   150 m × 0.03 dB/m = 4.5 dB
2. Set Receiver Sensitivity A for the RBS to "Short haul".
3. Set Receiver Sensitivity B, C, and D for the RBS to "Short haul" (not connected).

Example 5 Calculating Receiver Sensitivity Parameters for Transmission Interface E1, 120 Ω

Transmission Interface T1, 100 Ω

This section describes how to define parameters for transmission interface T1. When using the cable length for calculations in the following sections, the cable used must be the reference cable (multipair 22 AWG office cable) or similar.

1. Find the transmission interface type in the *Site Installation Documentation*, and use the table below to find the applicable section with instructions for setting the parameters.

Table 38 Selecting Section for Defining T1, Knowing the Transmission Interface Type

If the transmission interface type is...		**Then...**
DSX-1		go to *Section Defining LBO Parameters as Short Haul on Page 130*.
DS1 and...	the signal level at the customer interface and the cable attenuation is known	go to *Section Defining LBO Parameters as Long Haul Manually on Page 132*.
	only the maximum input signal level at the far end is known	go to *Section Defining LBO Parameters as Long Haul Automatically on Page 134*.
	neither the signal level at the customer interface nor the cable attenuation are known	go to *Section Defining LBO Parameters when Transmission Characteristics are Unknown on Page 138*.

2. If there is no information about the transmission interface type in the *Site Installation Documentation*, use the cable length to find the appropriate section in the table below.

Table 39 Selecting Section for Defining T1, Knowing the Cable Length

If...		**Then...**
the cable length is less than 655 feet		go to *Section Defining LBO Parameters as Short Haul on Page 130*.
the cable length is more than 655 feet and...	the signal level at the customer interface and the cable attenuation is known	go to *Section Defining LBO Parameters as Long Haul Manually on Page 132*.
	only the maximum input signal level at the far end is known	go to *Section Defining LBO Parameters as Long Haul Automatically on Page 134*.
	neither the signal level at the customer interface nor the cable attenuation are known	go to *Section Defining LBO Parameters when Transmission Characteristics are Unknown on Page 138*.

3. If no information is given in Site Installation Documentation, *see the table below.*

Table 40 Selecting Section for Defining T1, Without any Information about the Cable Length

If...	Then...
there is no information about the cable length	go to *Section Defining LBO Parameters when Transmission Characteristics are Unknown on Page 138*.

Note: Calculating the total attenuation of the entire RBS chain is only necessary if multidrop (in combination with OVPs with bypass relays) is used.

Defining LBO Parameters as Short Haul

This section describes how to define the LBO parameters as short haul.

1. On the **Configuration** menu, click **Define** and **PCM** to open the Define PCM window.
2. Set the parameters according to the table and instructions below.
3. Click **OK** when all parameters are set.

Table 41 PCM parameters Settings for Transmission Interface T1, Short Haul

PCM Parameter	Setting
Transmission Interface	DS1(T1)
Network Topology	*See Site Installation Documentation*
Sync Source	*See Site Installation Documentation*
LBO A	*See instructions below*
LBO B	
LBO C	
LBO D	
FDL Use	*See Site Installation Documentation*

The instructions below describe how to calculate the LBO parameters.

Note: Ports C and D can also be used as a multidrop pair.

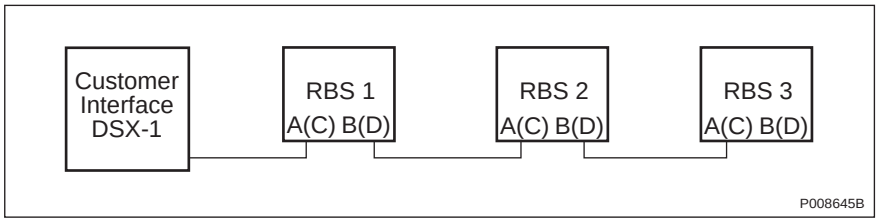


Figure 55 System View for Transmission Interface T1, Short Haul

1. Find out the length of the cable between the RBS and the customer interface (the cross-connection point DSX-1). *See figure above.*

   If multidrop is used, calculate the attenuation of the entire RBS chain, since LBO A (C) is determined by the total attenuation of the chain from port A (C) to the Customer Interface. LBO B (D) is determined by the total attenuation to the last RBS in the chain.

   If the cable length is not known, set the LBO parameters to "Short h., 0 – 133 feet".

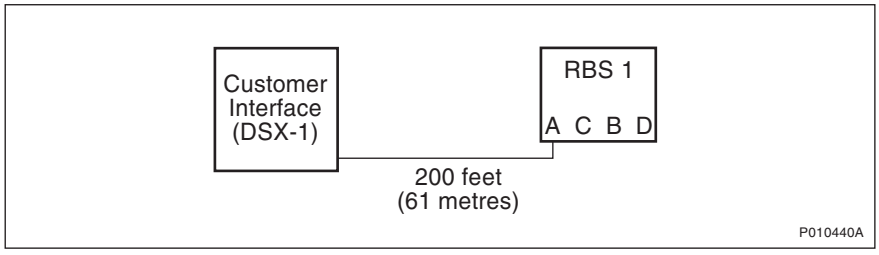
2. Use the cable length and the table below to set the correct LBO parameters in the OMT.

Table 42 Setting LBO Parameters to Short Haul in the OMT

Cable Length		**LBO Setting**
Feet	**Metres**	**(in the OMT)**
0 – 133	0 – 40	Short h., 0 – 133 feet
133 – 266	40 – 81	Short h., 133 – 266 feet
266 – 399	81 – 122	Short h., 266 – 399 feet
399 – 533	122 – 162	Short h., 399 – 533 feet
533 – 655	162 – 200	Short h., 533 – 655 feet

3. Set unused ports to "Short h., 0 – 133 feet".

The following example illustrates what is said above.




```
In this example, customer interface (DSX-1) and the RBS
refer to the figure above.
The cable length between the RBS and the customer interface
(DSX-1) is 200 feet (61 m).
1. Set LBO A for the RBS to "Short h., 133 – 266 feet"
 See the table above
2. Set LBO B, C and D for the RBS (not connected)
 to "Short h., 0 – 133 feet".
```

Example 6 Setting LBO Parameters to Short Haul

Defining LBO Parameters as Long Haul Manually

This section describes how to define LBO as long haul, when the signal level at the customer interface and the cable attenuation is known.

Signal level at the customer interface means either the maximum input signal level at the Far End, or the carrier-advised code at the network interface. *See figure below.*

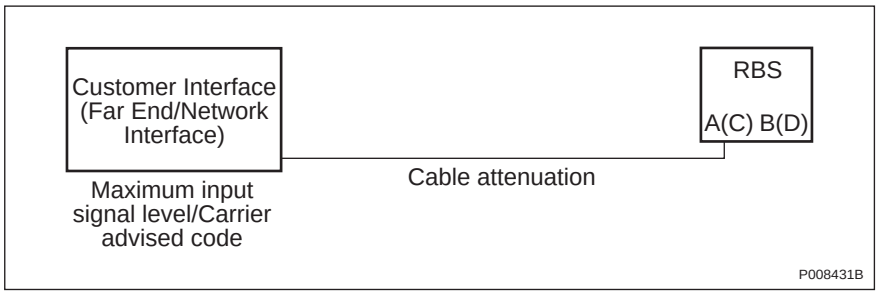


Figure 56 System Parameters for Defining LBO Parameters to Long Haul

1. On the **Configuration** menu, click **Define** and **PCM**.
2. Set the parameters according to the table and instructions below.
3. Click **OK** when all parameters are set.

Table 43 Manual PCM Parameters Settings for Transmission Interface T1, Long Haul

PCM Parameter	Settings
Transmission Interface	DS1(T1)
Network Topology	*See Site Installation Documentation*
Sync Source	*See Site Installation Documentation*
LBO A	*See instructions below*
LBO B	
LBO C	
LBO D	
FDL Use	*See Site Installation Documentation*

The instructions below describe how to manually set the LBO parameters to long haul.

1. If the carrier-advised code is given in the *Site Installation Documentation*, use the table below to set the correct A (B, C, D) LBO parameters.

   If multidrop is used, calculate the attenuation of the entire RBS chain, since LBO A (C) is determined by the total attenuation of the chain from port A (C) to the Customer Interface.

Table 44 Long Haul Parameters for Different Carrier-Advised Codes at the Network Interface

Cable Attenuation (dB)	Long Haul Parameters for Different Values of the Carrier-Advised Code at the Network Interface			
	A (0 dB)	**B (-7.5 dB)**	**C (-15 dB)**	**D (-22.5 dB)**
0 – 7.5	0	-7.5	-15	-22.5
7.5 – 15	n/a	0	-7.5	-15
15 – 22.5	n/a	n/a	0	-7.5
> 22.5	n/a	n/a	n/a	0

2. If the maximum input signal level is given in the *Site Installation Documentation*, use the table below to set the correct LBO A (B, C, D) parameters.

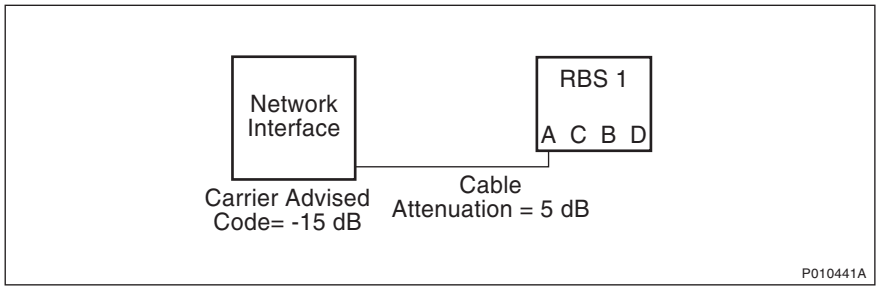
Table 45 Long Haul Parameters for Different Maximum Input Signal Levels

Cable Attenuation (dB)	Long Haul Parameters for Different Values of the Maximum Input Signal Level at the Far End			
	0 dB	**-7.5 dB**	**-15 dB**	**-22.5 dB**
0 – 7.5	0	-7.5	-15	-22.5
7.5 – 15	0	0	-7.5	-15
15 – 22.5	0	0	0	-7.5
> 22.5	0	0	0	0

3. If multidrop, set LBO B (D) to "Long h., 0 dB". Used B (D) ports in multidrop configurations should always be set to "Long h., 0 dB"

4. Set unused ports to "Short h., 0 – 133 feet". Unused ports should always be set to "Short h., 0 – 133 feet".

The following example illustrates what is said above.



In this example, network interface and the RBS refer to the figure above.
Carrier-advised code at the network interface is "C" (-15 dB).
The cable attenuation is 5 dB.

1. *See the table Long haul parameters for different carrier-advised codes at the network interface* to find the correct LBO parameter for LBO A.
2. Set LBO A to "Long h., -15 dB"
3. Set LBO B, C and D (not connected) to "Short h., 0 - 133 feet".

Example 7 Calculating LBO Parameters Manually for Long Haul

Defining LBO Parameters as Long Haul Automatically

This section describes how to define LBO to long haul when the maximum input signal level at the Far End is known, but not the cable attenuation. The cable attenuation can be measured by the RBS according to the instructions below. *See figure below.*

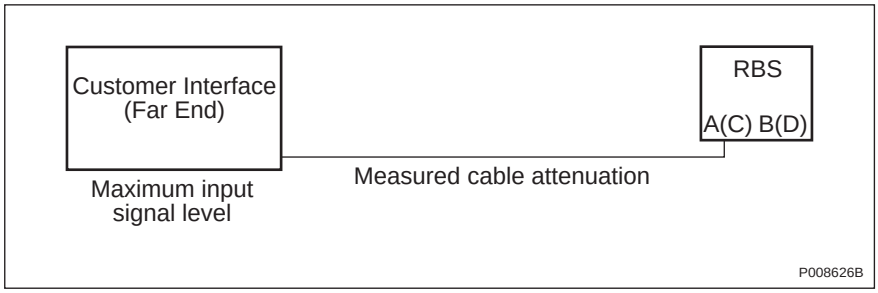


Figure 57 System Parameters for Defining LBO Parameters Automatically to Long Haul

1. On the **Configuration** menu, click **Define** and **PCM**.
2. Use the table and instructions below to set the parameters.
3. Click **OK**, when all parameters are set.

Table 46 PCM Parameters Settings for Transmission Interface T1, Long Haul Automatically

PCM Parameter	Setting
Transmission Interface	DS1(T1)
Network Topology	*See Site Installation Documentation*.
Sync Source	*See Site Installation Documentation*
LBO A	*See instructions below*
LBO B	
LBO C	
LBO D	
FDL Use	*See Site Installation Documentation*

The instructions below describe how to automatically set the PCM parameters.

For RBS 1 only:

1. Set LBO A (C) to "Long h. ALBO, <value of the maximum input signal level> dB".

2. If stand alone, set unused ports to "Short h., 0 – 133 feet". Unused ports are always set to "Short h., 0 – 133 feet".

   The RBS automatically sets the correct value in the IDB when the IDB is installed.

Note: The following instructions apply only to multidrop.

If multidrop is used, the line attenuation for RBS 1 must be measured according to the instructions below.

For RBS 1:

1. Set LBO B (D) to "Long h., 0 dB". Used B (D) ports in multidrop are always set to "Long h., 0 dB"

2. On the **RBS 2000** menu, click **Connect**.

3. On the **Configuration** menu, click **Install IDB**.

   The RBS will automatically set the correct value in the IDB.

   The RBS remains in Local mode after the IDB has been installed.

4. On the **Maintenance** menu, click **Monitor**.

5. In the Available monitors box, select "Line Attenuation for PCM-A" (C) and click → to add "PCM" in the Monitors to start box. *See figure below.*

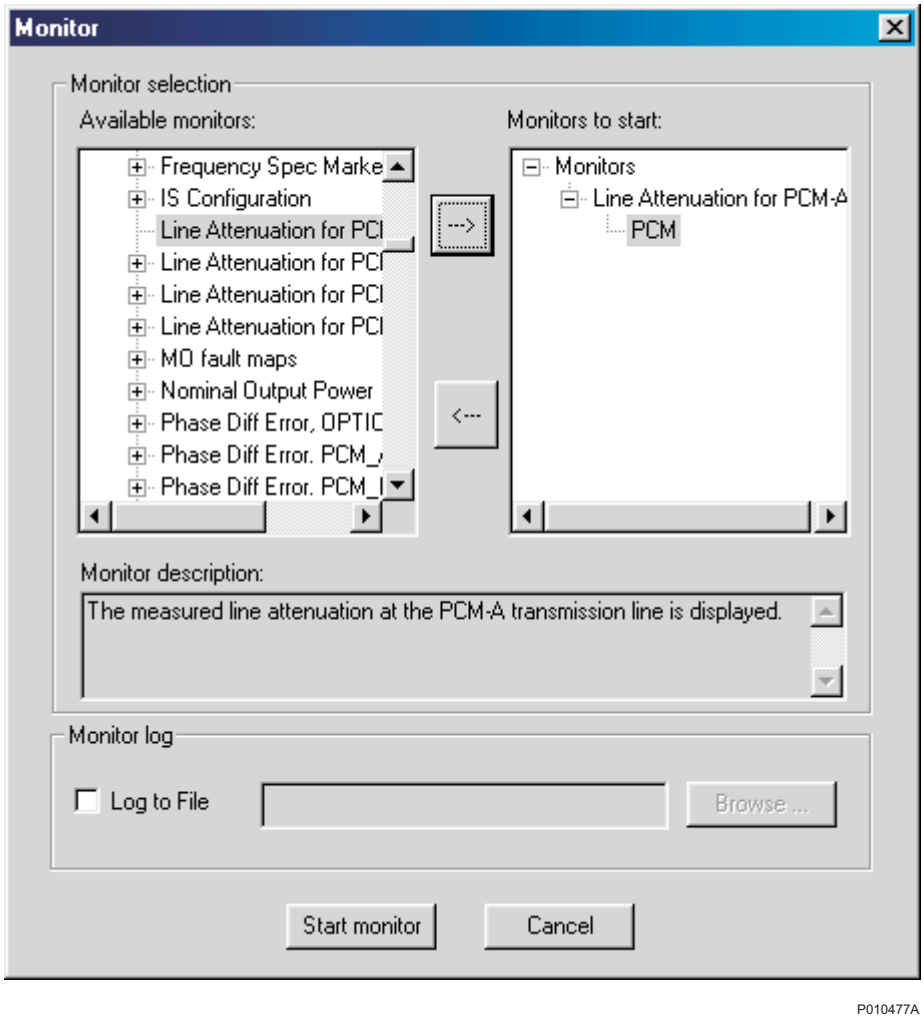


Figure 58 Monitoring Cable Attenuation

6. Click on **Start Monitor** and read the value of the cable attenuation. The displayed value is given in deci dB (10 deci dB = 1 dB). Make a note of the value in the test record.

When configuring the IDB for RBS 2 and RBS 3, follow the instructions below.

For RBS 2 and RBS 3:

7. Set LBO A (C) on RBS 2 (RBS 3) to "Long h. ALBO, 0 dB".

8. On the **Configuration** menu, click **Install IDB**.

9. On the **Maintenance** menu, click **Monitor**.

10. In the Available monitors box, select "Line Attenuation for PCM-A" (C) and click → to add "PCM" in the Monitors to start box.

11. Click on **Start Monitor** and read the value of the cable attenuation. The displayed value is given in deci dB (10 deci dB = 1 dB). Make a note of the value in the test record.

12. Add the measured cable attenuation values. The value given by Lin Att PCM A (C) is the cable attenuation to the previous RBS in the chain, so the measured value must be added to the value for the previous RBS(s) to obtain the total cable attenuation for the RBS in question.

13. Use the total cable attenuation value to find the long haul parameter value for LBO A (C) in the table below.

Table 47 Long Haul Parameters for Different Maximum Input Signal Levels

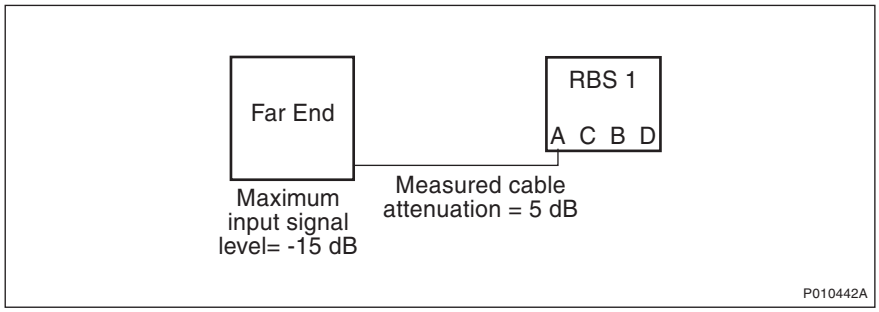
Cable Attenuation (dB)	**Long Haul Parameters for Different Maximum Input Signal Levels at the Far End**			
	0 dB	**-7.5 dB**	**-15 dB**	**-22.5 dB**
0 – 7.5	0	-7.5	-15	-22.5
7.5 – 15	0	0	-7.5	-15
15 – 22.5	0	0	0	-7.5
> 22.5	0	0	0	0

14. If there is another RBS in the chain, set LBO B (D) to "Long h., 0 dB". Used B ports are always set to "Long h., 0 dB".

    If this is the last RBS in the chain, set LBO B (D) to "Short h., 0 – 133 feet". Unused ports are always set to "Short h., 0 – 133 feet".

15. If there is another RBS in the chain, repeat steps 7 to 14.

The following example illustrates what is said above.



```
In this example, Far End and RBS refer to the figure above.
Maximum input signal level at the Far End is -15 dB.
The cable attenuation is not known.

1. Set LBO A to "Long h. ALBO, -15 dB".
 The cable attenuation is measured by the RBS to 5 dB.
2. The value of LBO A is set automatically by the RBS.
3. Set LBO B, C and D (not connected) to
 "Short h., 0 - 133 feet".
```

Example 8 Calculating LBO Parameters Automatically for Long Haul

Defining LBO Parameters when Transmission Characteristics are Unknown

This section describes how to define the LBO parameters if none of the parameters carrier-advised code, maximum input signal at the customer interface, cable attenuation, or cable length are known.

1. On the **Configuration** menu, click **Define** and **PCM**.

2. Set the parameters according to the table below. Click **OK** when all parameters are set.

Table 48 PCM Parameters Settings for Transmission Interface T1, Transmission Characteristics Unknown

PCM Parameter	Settings
Transmission Interface	DS1(T1)
Network Topology	*See Site Installation Documentation*
Sync Source	*See Site Installation Documentation*
LBO A	"Long h., 0 dB"
LBO B	"Long h., 0 dB", if used "Short h., 0 – 133 feet", if unused
LBO C	"Long h., 0 dB" "Short h., 0 – 133 feet", if unused
LBO D	"Long h., 0 dB", if used "Short h., 0 – 133 feet", if unused
FDL Use	*See Site Installation Documentation*

7.6.12 Defining TEI

This section describes how to define the TEI value for the IXU.

To enable the BSC to communicate with the IXU of an RBS in a cascade chain, a unique TEI value between 12 and 63 needs to be set for each RBS in the

chain. The TEI value for the RBS must also match the TEI value the BSC uses to identify the RBS. For RBSs not connected in a cascade chain, the default TEI value can be used.

1. On the **Configuration** menu, click **Define** and **TEI** to open the Define TEI dialog box.

2. Click **Run** to open the Define TEI for IXU 0 window.

3. Enter the TEI value found in the *Site Installation Documentation*. Click **OK**.

7.6.13 Defining TNOM

This section describes how to define the Transport Network Operation and Maintenance (TNOM) parameters if supported by the network (DXX support).

DXX support enables an O&M centre to monitor the transmission performance of an RBS. The table below describes the TNOM parameters possible to define.

Table 49 TNOM Parameters

Parameter	Valid Values	Default	Description
TNOM use	On, Off	Off	Activates or deactivates DXX support in an RBS.
TNOM timeslot	E1: 1 – 31 T1: 1 – 24	E1: 31 T1: 24	Defines the 64 kbps timeslot on the E1/T1 link that is used for DXX support of the RBS. It needs to be set only if TNOM use is on.
TNOM node Id	1 – 65534	1	Defines a unique identifier for a node, such as an RBS in a DXX network. It must only be set if TNOM use is on and must be equal to the value set in the O&M centre.

1. On the **Configuration** menu, click **Define** and **TNOM** to open the Define TNOM window.

2. Set TNOM Use to "On".

3. In the TNOM Timeslot box, enter the value. Valid TNOM time slot values are shown in the table above.

4. In the TNOM Node ID box, enter the correct values. Valid TNOM Node ID values are found in the table above. Click **OK** when finished.

7.6.14 Installing IDB

This section describes how to install the IDB in the RBS, by connecting the OMT to the RBS and loading the IDB from the PC to the RBS.

Note: Using the OMT, always reload the software and install the appropriate IDB after moving a used flash card to another cabinet. This ensures consistent software and correct configuration.

Note: The RBS must be in Local mode in order to accept a new or modified IDB.

Note: Do not touch the RBS when any indicators are double-flashing. *See section Double-Flash Indication of Function Changes* in *chapter Maintenance*.

1. Physically connect the OMT to the RBS if not already connected. *See Section 7.6.2 Connecting OMT on page 118*.

2. On the **RBS 2000** menu, select **Connect** to connect the OMT logically to the RBS.

3. On the **Configuration** menu, click **Install IDB**.

   If the OMT detects inconsistencies between the RBS HW and the IDB, then the differences will be displayed in a window. However, the IDB in the RBS can still be overwritten if an RBS/IDB inconsistency has been detected. The IXU and RRUs remain in Local Mode after the IDB has been installed.

4. On the **Configuration** menu, click **Site Specific Data** and **Display** to open the site_specific_data.txt - window. Check that the correct parameters have been defined.

7.7 Reading Fault Status

This section describes how to read the fault status, using the OMT. If any fault indicator on the RBS is on, fault status must be read.

1. Read the IDB if it has not already been read. *See Section 7.6.3 Reading IDB on page 118*.

2. On the **Maintenance** menu, click **Monitor** to open the Monitor window. *See figure below.*

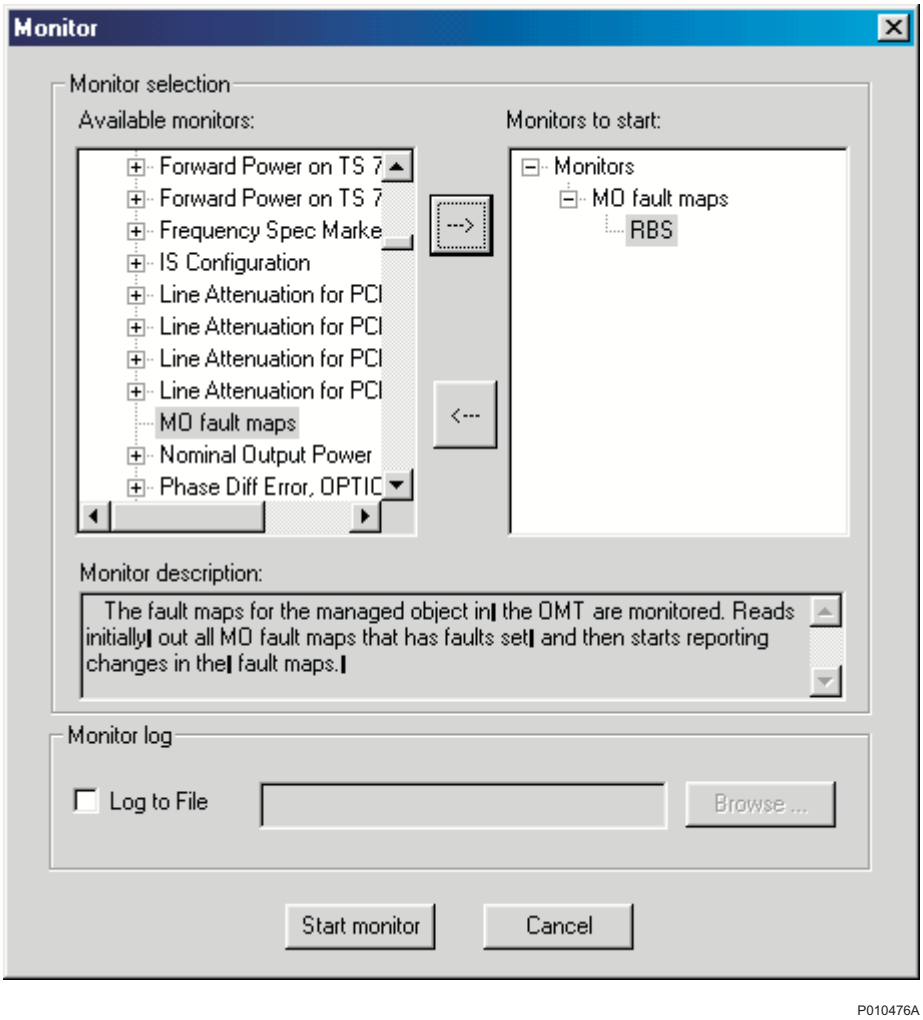


Figure 59 Reading Fault Status

3. In the Available monitors box, select "MO fault maps" and click → to add "RBS" into the Monitors to start box.

4. Click **Start monitor**.

5. In the RBS Event Monitor window, check the MO faults box to see if there are any faults. If there are, then correct these before continuing.

   When an MO fault is selected, corresponding fault description, action, and related faults are displayed. See also:

   Fault List Micro *EN/LZT 720 0466*

6. Close the RBS Event Monitor window.

7.8 Testing External Alarms

This section describes how to use the OMT to test that all external alarms, if used, are recognized and handled correctly. The test is passed when all alarms are recognized.

Note: The alarms must be individually identifiable in the OMT. There must be no doubt which alarm was indicated. The alarm message must be unique for each alarm.

1. On the **Maintenance** menu, click **Monitor** to open the Monitor window. *See figure below.*

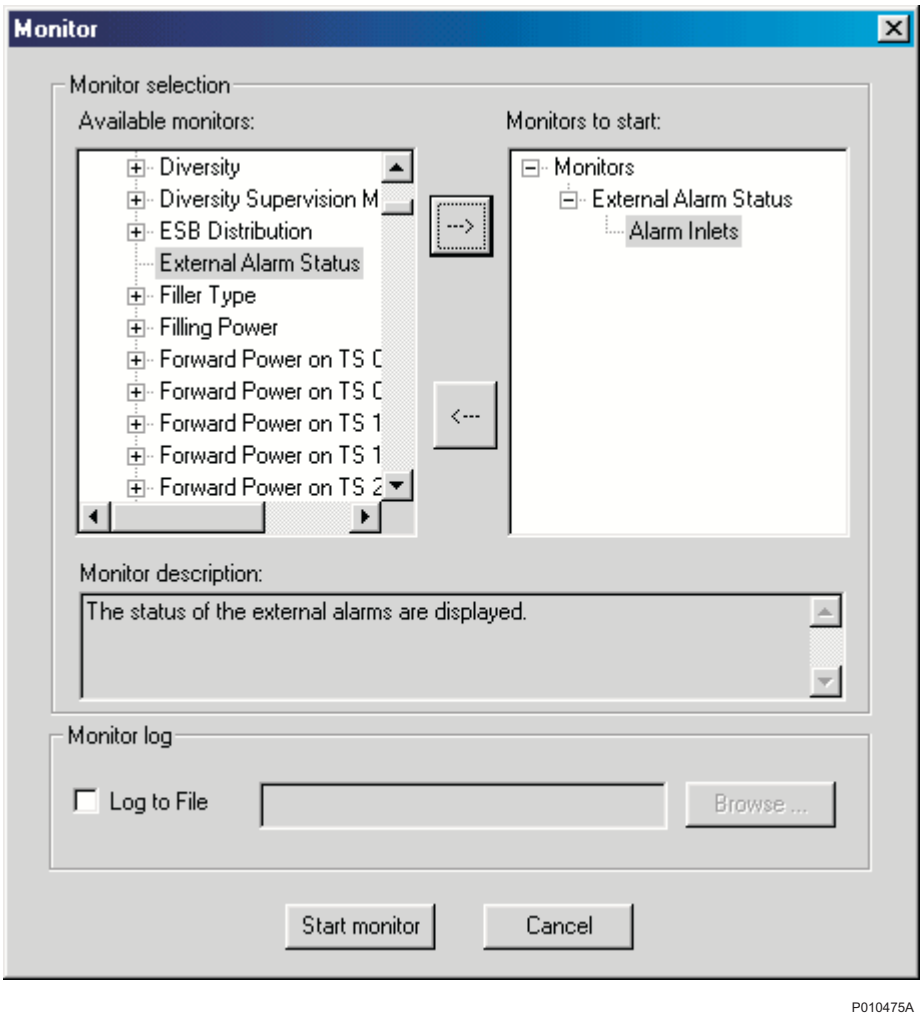


Figure 60 Testing External Alarms

2. In the Available monitors box, select "External Alarm Status" and click → to add "Alarm Inlets" in the Monitors to start box.

3. Click **Start monitor**.

4. Trigger the desired alarm by either shorting or breaking it.

Note: Test the alarms in numerical order, and always start with alarm 1.

5. Check that the appropriate alarm appears in the RBS Event Monitor window.

6. Release the trigger on the alarm and check that the alarm disappears from the OMT.

7. Repeat steps 4 to 7 for all defined external alarms.

8. Close the RBS Event Monitor window when finished.

7.9 Performing Concluding Routines

This section describes the actions to take before leaving the site and provides a site checklist. It also contains a test record.

7.9.1 Saving IDB

In case it is necessary to re-install the IDB, the IDB parameters must be saved on the PC.

1. On the **Configuration** menu, click **Save IDB**.

2. Give the IDB file an RBS-specific name and save the IDB on the PC.

7.9.2 Checking RRU and IXU Indicators

1. Ensure that all lids are closed and fastened with screws.

2. Set the RRU and IXU in remote mode by pressing the **Local/Remote** button.

3. Check that the RRU and IXU indicators have the status shown in the applicable table below:

- Table 50 on page 144 shows the approved status of the RRU and IXU indicators when the RBS is in remote mode but not connected to the BSC.

- Table 51 on page 144 shows the approved status of the RRU and IXU indicators when the RBS is in remote mode, fully operational, and connected to the BSC.

Table 50 RRU and IXU Indicators After Site Installation Tests Without BSC Connection

RBS in remote mode and no BSC connected			
RRU Indicator		**IXU Indicator**	
Fault	Off	Fault	Off
Operational	Off	Operational	Off
Local	Flashing	Local	Flashing
RF off	On	RBS fault	Off
AC power on	On(1)	External alarm	Off
DC power on	On(1)	AC power on	On(1)
RRU temp.	Off	DC power on	On(1)
		IXU temp.	Off
		Transmission OK	On/Off(2)

(1) Depending on power system configuration.

(2) A, B, C, and/or D, depending on transmission configuration.

Table 51 RRU and IXU Indicators After Site Installation Tests With BSC Connection

RBS in remote mode, fully operational and connected to the BSC			
RRU Indicator		**IXU Indicator**	
Fault	Off	Fault	Off
Operational	On	Operational	On
Local	Off	Local	Off
RF off	On/Off(1)	RBS fault	Off
AC power on	On(2)	External alarm	Off
DC power on	On(2)	AC power on	On(2)
RRU temp.	Off	DC power on	On(2)
		IXU temp.	Off
		Transmission OK	On(3)

(1) Depending on BSC.

(2) Depending on power system configuration.

(3) A, B, C, and/or D, depending on transmission configuration.

4. If the Operational indicator on the RRU or IXU is double-flashing(1), software is being downloaded from the BSC. The software download take from 10 to 60 minutes. If the Operational indicator continues to double-flash, contact the OMC operator for further instructions.

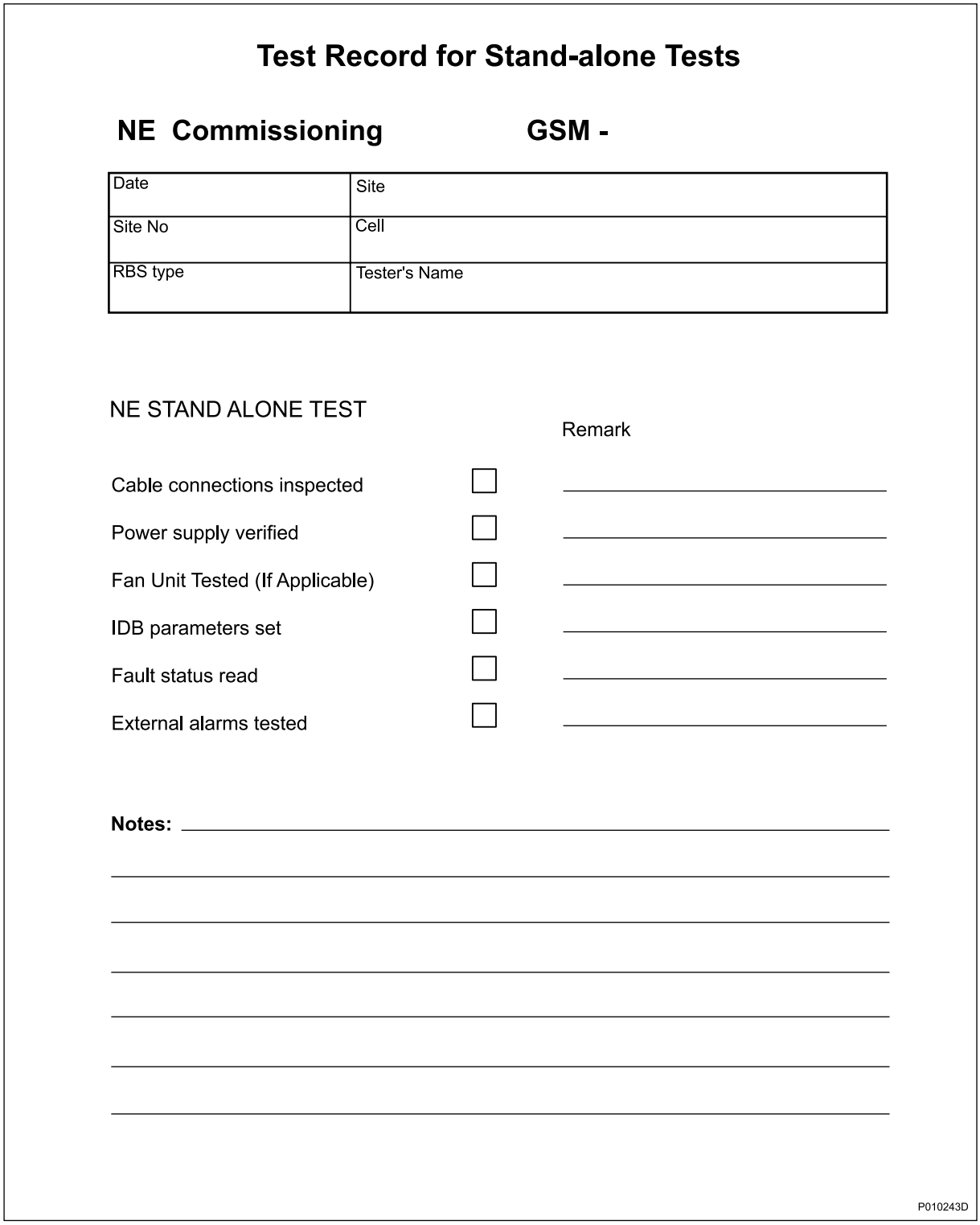
   (1) For R12 and later software versions

5. If the Local indicator on the RRU or IXU does not have the correct status, press the **Local/Remote** button to switch status.

6. If RBS site integration is not performed immediately after site installation tests, then close the sunshields.

7.9.3 Completing the Test Record

This section contains a test record. It is recommended to fill in the test record during the testing procedure.



Test Record for Stand-alone Tests

NE Commissioning GSM -

Date	Site
Site No	Cell
RBS type	Tester's Name

NE STAND ALONE TEST

		Remark
Cable connections inspected	☐	_____
Power supply verified	☐	_____
Fan Unit Tested (If Applicable)	☐	_____
IDB parameters set	☐	_____
Fault status read	☐	_____
External alarms tested	☐	_____

Notes: _____

_____

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Figure 61 Test Record for Site Installation Tests

7.9.4 Filling in the Checklist

The following checklist is not mandatory but strongly recommended. Local procedures and safety regulations must be evaluated and included in this checklist.

Table 52 Checklist

Check the following:		**OK**
1	The indicators on the RRU and the IXU are in the approved status.	
2	The test equipment has been disconnected from the RBS	
3	The RBS cabinet and the mounting base are free from foreign objects.	
4	All cabinets and cables are free of damage.	
5	All EMC sealants and cable penetrations are intact.	
6	Top and bottom of cabinet are free of obstructions (for airflow).	
7	The cabinet has been locked, and the screws have been tightened.	
8	All tools have been accounted for.	
9	All paperwork has been completed.	

8 PSTU Startup

This chapter describes the initial configuration of the Packet-Switched Termination Unit (PSTU). All activities in this chapter can be performed on-site. Some activities can also be performed in-house. The default is to perform all activities on site, which is how they are described in this chapter. For further information regarding the activities that can be performed in-house, see *Section 8.2 Work Process for PSTU Startup on page 150*.

When an RBS 2308 is configured with a PSTU for IP-based transmission, a maximum of four Transceivers (TRX) can be used.

The PSTU is in remote operation after startup, which means that it has an Internet Protocol (IP) address, the IP stack is in operation, and the PSTU can be remotely operated from the Operations Support System (OSS). Further configuration is required from the OSS to enable the PSTU to carry traffic.

Note that the instructions in this chapter include information about the optical Ethernet interface that is not supported in the first software release.

8.1 Preconditions

Before starting up the PSTU, ensure that the following conditions are met:

- The chapters *Personal Health and Safety Information* and *System Safety Information* have been read
- A completed test record for RBS stand-alone test is available
- Site configuration data is available (see section Documentation below)
- The Ethernet cables are not connected to the PSTU
- Power is applied to the RBS
- An OSS is available through an IP network and is prepared to manage the PSTU
- The PSTU engineer on-site is in contact with an OSS operator, who is prepared to verify detection of the PSTU
- A test record is available to record this procedure

8.1.1 Documentation

The following documents must be available before starting up the PSTU:

Site Installation Documentation

PSTU Command Description *1/190 82-LZA 701 0001*

PSTU Managed Object Model *42/1551-LZA 701 0001*

PSTU Alarm OPIs

8.1.2 Tools

Before starting up the PSTU, ensure that the following are available:

- A PC equipped with a VT100 terminal emulator program (the PC is referred to as the local terminal in this chapter)
- A serial cable, such as the standard Operation and Maintenance Terminal (OMT) cable, for connecting the serial port of the local terminal to the console port of the PSTU
- Tools for RBS maintenance (see chapter Tools and Instruments, section Equipment for Maintenance in the RBS 2308 and RBS 2309 User's Guide)

8.2 Work Process for PSTU Startup

This section describes the PSTU startup sequence. When the exit criteria are fulfilled, the tester enters the results in the test record, and returns to the work process for the next step in the process.

All activities in this chapter are described as being performed on-site. Alternatively, the initial parameter-setting of the PSTU can be performed in-house. All command handling from the local terminal is then performed in-house, while the rest of the activities must still be performed on-site.

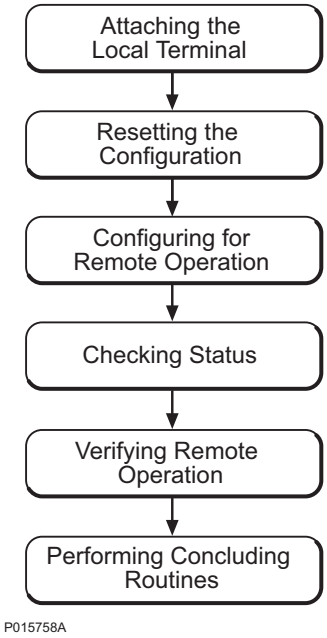


Figure 62 Work Process

8.3 Procedure

This section describes how to put the PSTU into remote operation.

For more information on command attributes, examples, responses, and alarms, *see section Documentation* above.

8.3.1 Attaching the Local Terminal

This section describes how to attach the local terminal to the PSTU.

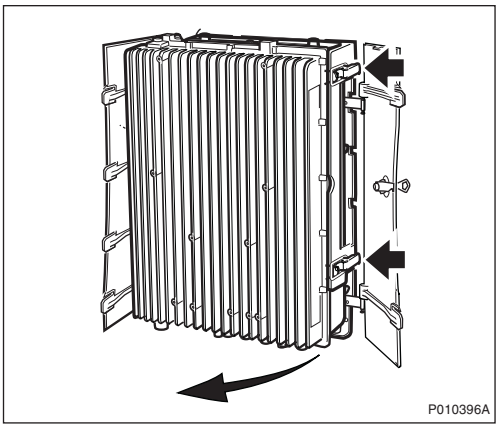
1. Start the local terminal and ensure that the communication parameters for the terminal are correct. *See table below*.

Table 53 Local Terminal Parameters

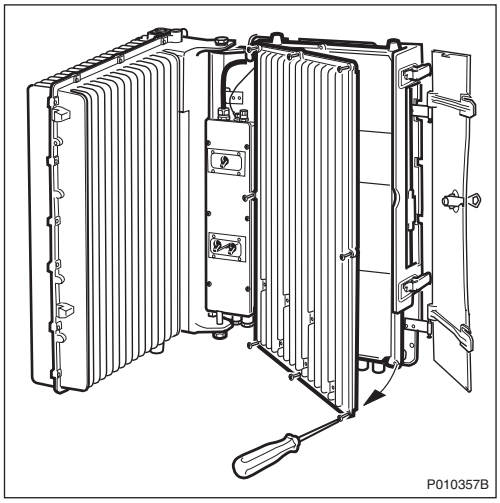
Parameter	Value
Bits per second	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

2. Remove the sunshields covering the RBS.

3. Open the two clasps and pull the Remote Radio Unit (RRU) to the left.



4. Open the Interface and Switching Unit (IXU) cover.



5. Connect the serial cable from the serial port of the local terminal to the console port of the PSTU, as shown in *the figure below*.

   The termination blocks for ports A–D are never used together with a PSTU and can thus be temporarily or permanently removed to make room for the serial cable.

Note: The connector of the serial cable has a metal frame that can short-circuit electronic equipment in the RBS. It is recommended that the connector be covered with insulation tape before connecting it to the PSTU.

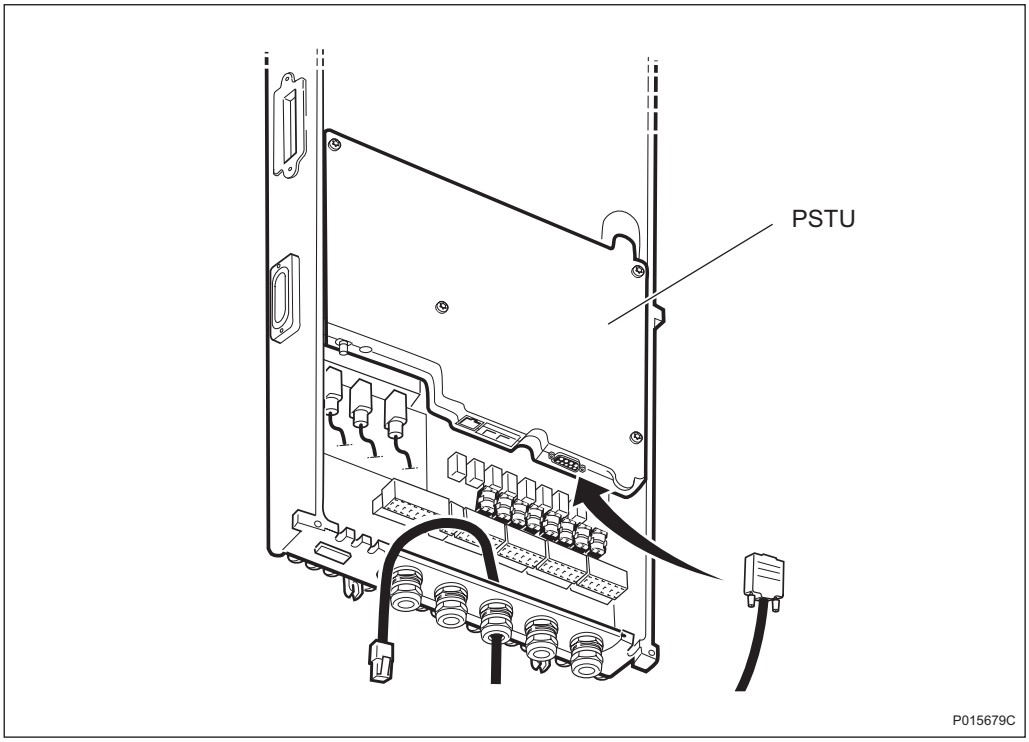


Figure 63 Local Terminal Serial Cable Connection

6. Press **ENTER** on the local terminal. The PSTU responds with a command prompt to confirm that communication is established between the local terminal and the PSTU.

8.3.2 Resetting the Configuration

This section describes how to reset the PSTU configuration and activate the default settings.

Note: It is not necessary to reset the PSTU configuration if the PSTU is already configured for the site. To read the attribute settings, the `getMoAttribute`command is used.

1. Reset all settings to default values.

   Command: `resetAllMoAttributesToDefault`
   Example: `resetAllMoAttributesToDefault`

2. Restart the PSTU to activate the default settings.

   Command: `restart`
   Example: `restart`

The PSTU restart takes a few minutes. The status of the PSTU indicators is shown in the table below.

Table 54 Indicator Status

Indicator	**Status**	
	During Restart	**After Restart**
Operational	Off	Flashing slowly: 0.5 Hz (local operation mode)
Fault	Red (first few seconds)	Off

8.3.3 Configuring for Remote Operation

This section describes how to connect the PSTU to the IP network and configure the PSTU for remote operation.

1. Connect the correct Ethernet cable for IP transmission. *See figures below*. Optical Ethernet connections are *shown in Figure 64 on page 155*, and electrical Ethernet connections are *shown in Figure 65 on page 156*.

   For instructions on passing the Ethernet cables through the most suitable inlet or slot into the PSTU, *see chapter Reconfiguring the RBS for IP Transmission* in the *RBS 2308 and RBS 2309 User's Guide*.

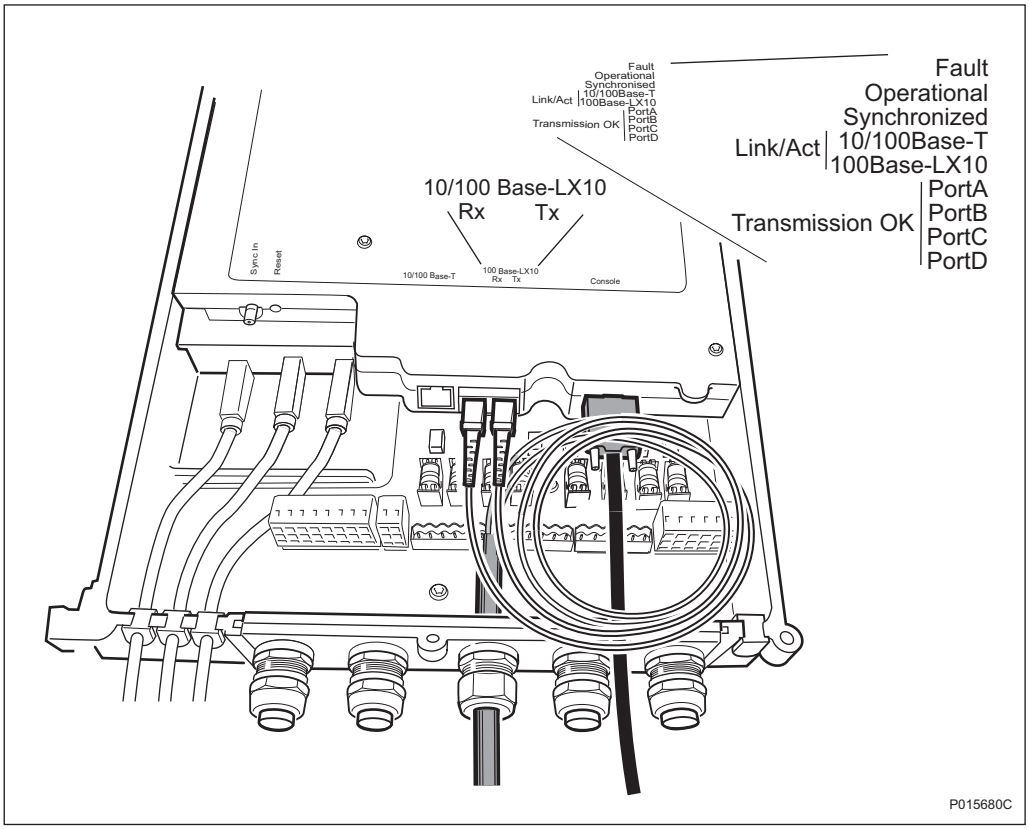


Figure 64 10/100 Base-LX10 Optical Ethernet Cable Connection

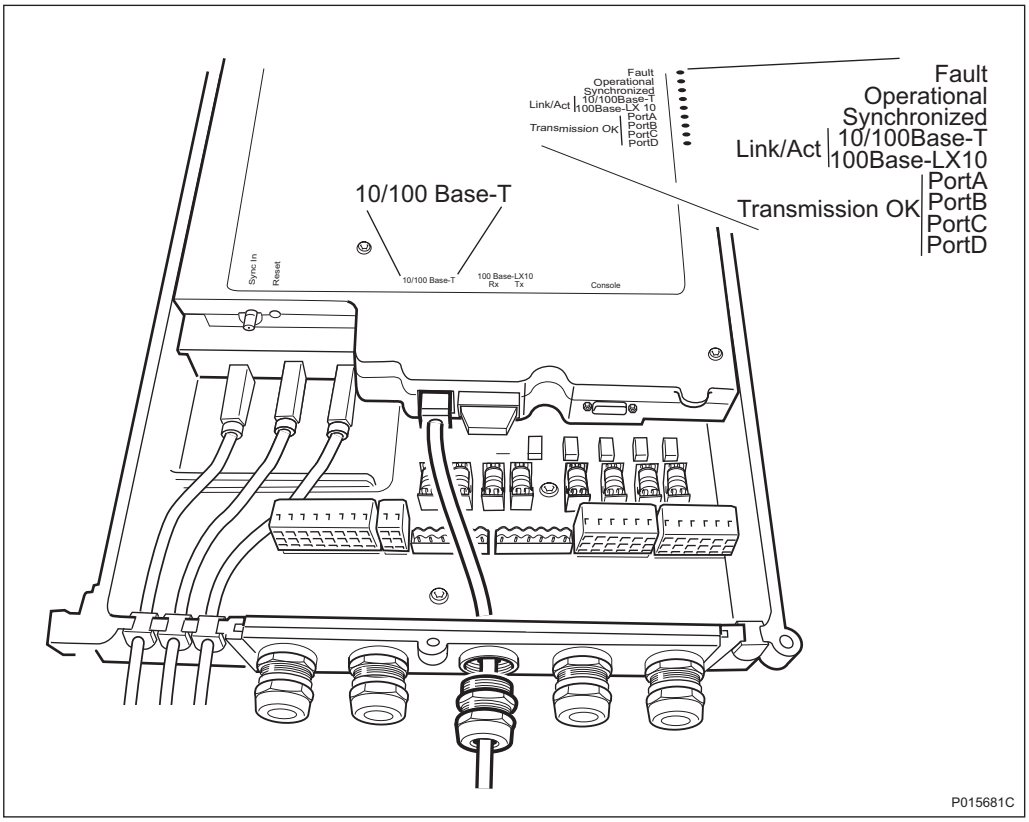


Figure 65 10/100 Base-T Electrical Ethernet Cable Connection

For more information on the commands used in the steps below, *see:*

PSTU Command Description *1/190 82-LZA 701 0001*

2. If optical Ethernet is used, then set the Ethernet interface type to optical. The default value is electrical.

   Command: `setMoAttribute`
   Example:
   `setMoAttribute PST=0,EthernetInterface=0 type optical`

3. Set the PSTU *IP_Address*.

   Command: `setMoAttribute`
   Example:
   `setMoAttribute PST=0 IP_Address 192.168.59.64`

4. Set the *subNetMask*.

   Command: `setMoAttribute`
   Example:
   `setMoAttribute PST=0 subNetMask 255.255.255.0`

5. Set the *defaultGateway*.

   Command: `setMoAttribute`
   Example:
   `setMoAttribute PST=0 defaultGateway 192.168.59.1`

6. Set the *hostName*.

   Command: `setMoAttribute`
   Example: `setMoAttribute PST=0 hostName pstuKista2`

7. Set the *wakeUpRegistration* IP address.

   Command: `setMoAttribute`
   Example:
   `setMoAttribute PST=0 wakeUpRegistration 192.168.59.62`

8. Set the *wakeUpEventInterval*.

   Command: `setMoAttribute`
   Example: `setMoAttribute PST=0 wakeUpEventInterval 10`

9. Change the password for Secure Shell (SSH) login from the OSS. The new password is required at the next SSH login.

   Command: `changePWD`
   Example: `changePWD oldPasswd newPasswd newPasswd`

10. Restart the PSTU to activate the new settings.

    Command: `restart`
    Example: `restart`

The PSTU restart takes a few minutes. After restarting, the PSTU temporarily passes through local mode and then changes to remote mode. The status of the PSTU indicators is shown in the table below.

Table 55 Indicator Status

Indicator	Status	
	During Restart	**After Restart**
Operational	Off	Flashing: on 2 s, off 0.2 s (remote operation mode)
Fault	Red (first few seconds)	Off

9. Verify the settings for each of the attributes.
   Command: `getMoAttribute`
   Example: `getMoAttribute PST=0 wakeUpEventInterval`

8.3.4 Checking Status

This section describes how to check the PSTU status after putting the PSTU into remote operation.

For more information on PSTU alarms and actions to be taken, *see*:

PSTU Alarm OPIs

1. Check the indicators on the PSTU. For more information on indicator status, *see chapter Maintenance* in the *RBS 2308 and RBS 2309 User's Guide*.

2. Check the PSTU log for alarms.

   Command: `log read`
   Example: `log read`

8.3.5 Verifying Remote Operation

To verify remote operation an OSS operator must be contacted to confirm that the PSTU can be remotely operated from the OSS.

8.3.6 Performing Concluding Routines

This section describes the necessary concluding routines after the PSTU has been put into remote operation.

1. Remove the local terminal cable from the PSTU.

2. Check the position of any optical cables used in the cabinet. Be careful not to damage them through excessive bending or coiling. The minimum bending radius is 50 mm.

3. Close the IXU cover and reattach the RRU.

   Note: Be careful not to crush or damage any cables.

4. Attach the sunshields.

5. Fill in the test record.

Filling in the Test Recod

This section contains the test record to be filled in during the PSTU startup.

Test Record for PSTU Startup

Date	Site Name
Site No	Cell configuration
RBS type	Tester's Name

		Remark
Configured for remote operation	☐	_____
Status checked, indicators	☐	_____
Status checked, alarms	☐	_____
Remote operation verified	☐	_____
Concluding routines performed	☐	_____

Notes: _____

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Figure 66 Test Record for PSTU Startup

9 RBS Site Integration

This chapter describes how to integrate the RBS with the BSC into the GSM network, and the tests used to verify the integration.

Integration is carried out with the RBS connected to a transmission link (PCM or Ethernet) and in close co-operation with a BSC operator.

All results must be documented in the test record.

Preconditions at the RBS Site

This section describes the preconditions for personnel at the RBS site before integrating the RBS.

Before starting the integration at the RBS site, ensure the following:

- The test record for Antenna System Tests has been completed
- The test record for Site Installation Tests has been completed
- If a PSTU is used in the RBS 2308, then it must be in the operational state traffic handling and the transmission between the PSTU and the BSC sub-node Packet Gateway (PGW), must be established
- If a PSTU is used in the RBS 2308 and the PSTU is used to synchronize the RBS, then the PSTU must be in synchronization status synchronized
- The RBS commissioning personnel are in contact with the BSC operator
- The RBS commissioning personnel and the BSC operator have agreed on the following parameters:
  - BCCHNO parameters
  - DCHNO parameters
  - BSIC parameters
  - Time slots (TS) used for SDCCH

Preconditions at the BSC

This section describes the preconditions for personnel at the BSC before integrating the RBS.

Before starting the integration at the BSC, ensure the following:

- The test record for Network Element (NE) has been completed

- The test record for Integration of MSC/VLR has been completed
- The BSC operator is in contact with the RBS commissioning personnel
- The BSC operator and the RBS commissioning personnel have agreed upon the following parameters:
  - BCCHNO parameters
  - DCHNO parameters
  - BSIC parameters
  - Time slots (TS) used for SDCCH

Work Process for RBS Site Integration

This section describes the order in which to perform the integration and tests. Each section should be completed and the results written in the test record before moving on to the next step in the process. *See Figure below*.

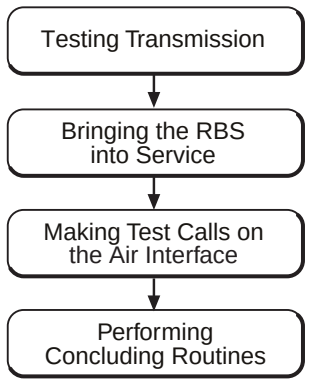


Figure 67 Work Process for RBS Site Integration

The work order can be altered, or tests can be removed due to local circumstances. However, before any such changes are made, an investigation of the consequences must be carried out. If the work order is changed or tests are removed, the department responsible for this manual must be notified and agree to the changes, or the responsibility is automatically transferred to the person making the decision.

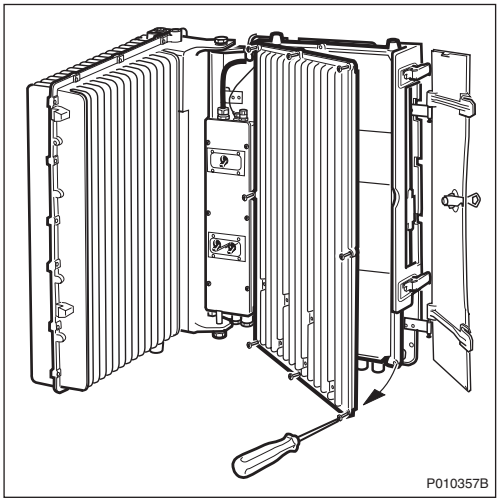
9.1 Testing Transmission

Note: This section applies to E1 and T1 PCM transmission. For IP-based transmission in the RBS 2308, *see chapter PSTU Startup* in this manual.

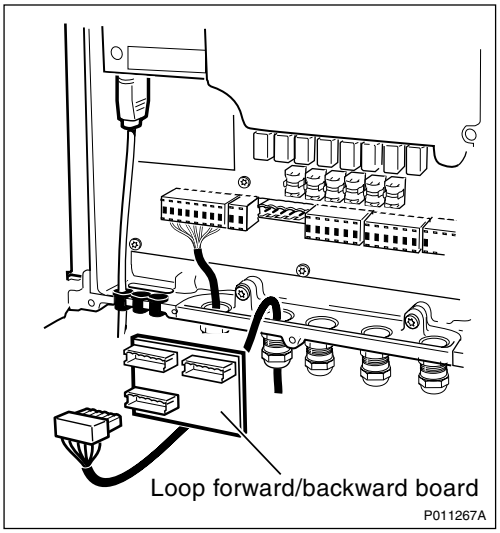
9.1.1 Transmission Test on E1

This section describes how to test transmission, when the E1 transmission interface is used.

1. Open the RRU, and the IXU cover.



2. Remove the PCM cable plug, starting with position A, and connect it to the Loop Back socket on the Loop forward/backward board.



3. Request that the BSC operator checks the Digital Path on the active RBLT.

4. Remove the PCM cable plug from the Loop forward/backward board and reconnect it to the socket in the IXU.

5. Wait for the BSC operator to confirm that the Abis Paths are correctly defined and that the Digital Path between the BSC and the RBS is working properly.

6. Repeat steps 2 to 5 for all used PCM lines.

7. Enter Pass/Fail in the test record, *see Section 9.4.2 Filling in the Test Record on page 171*.

9.1.2 Transmission Test on T1

This section describes how to test transmission, when the T1 transmission interface is used.

Note: Transmission test on T1 can also be performed in the same way as E1, according to *Section 9.1.1 on page 163*.

1. Request that the BSC operator uses CSU functions.
2. Configure the RBS for CSU, using OMT, and restart the RBS.

For more information regarding CSU ANSI, see:

BSS R11 Software Reference Manual EN/LZT 720 0047

1. Wait for the BSC to check the Digital Path on the active RBLT.
2. Deactivate CSU functions in the RBS, using OMT and restart the RBS.
3. Wait for the BSC operator to check that the Abis Paths are correctly defined and that the Digital Path between the BSC and the RBS works properly.
4. Enter Pass/Fail in the test record, *see Section 9.4.2 Filling in the Test Record on page 171*.

9.2 Bringing the RBS into Service

This section describes how to bring the RBS into service.

Note: The BSC operator can bring the MOs into service and deblock them even when the RBS is in remote mode. (The RBS then responds directly to the BSC operator.)

Note: Do not touch the RBS when any indicators are double-flashing. *See section Double-Flash Indication of Function Changes* in *chapter Maintenance*.

1. Set the RBS in local mode by pressing the **Local/remote** button on the IXU.

2. Wait until the yellow Local indicator has a constant light, indicating that the RBS is in local mode.

3. Wait for the BSC operator to bring the MOs on each TRX into service logically and deblock them.

4. Press the **Local/Remote** button on the IXU. The Local indicator will start flashing.

   The RBS now downloads and executes the commands previously prepared by the BSC operator. When the Local indicator turns off, the RBS is in remote mode.

5. Check that all RRUs are in remote mode by confirming that the Local indicator on each RRU is off.

6. If BTS PCM supervision is used, then wait for the BSC operator to activate it and check that MO DP state is operational.

7. Wait for the BSC operator to activate and check the cell.

9.3 Making Test Calls on the Air Interface

This section describes how to make test calls on the air interface. The tests are performed from the RBS site to verify that all TSs on all TRXs work properly.

The test calls are performed by using a Test Mobile Station (TEMS). See *TEMS Investigation GSM Manual* in the *TEMS Kit*.

Note: It is important to test all TCH-TSs to ensure full capacity.

All the test calls should be made from a distance of at least 50 m (164 ft) from the antenna system. *See Figure below*.

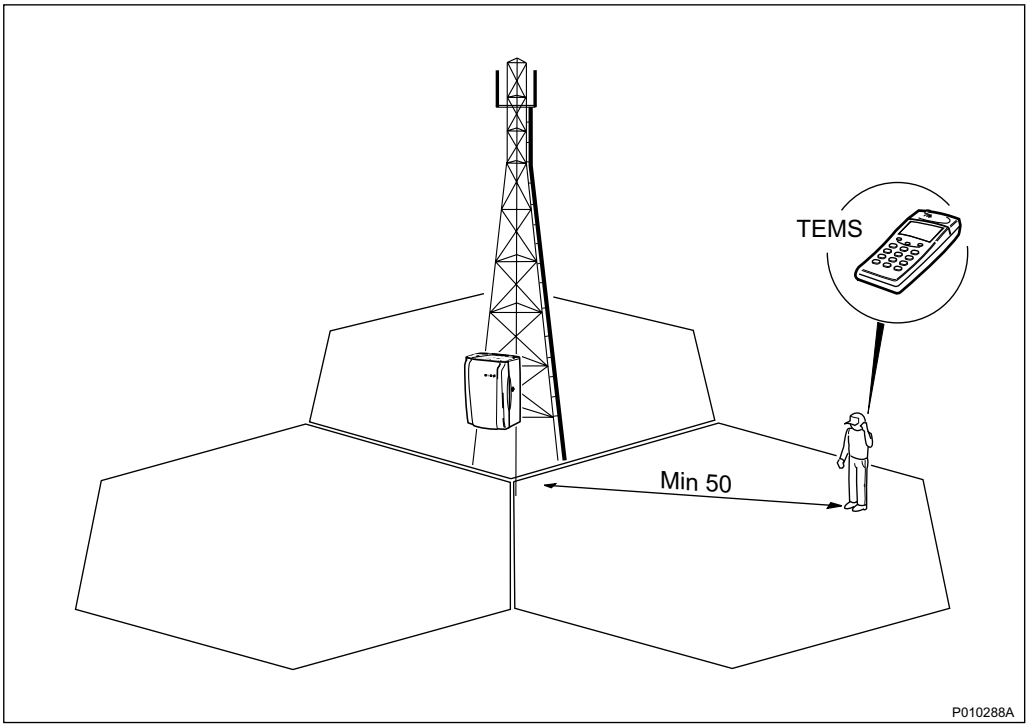


Figure 68 Distance From the Antenna System During Test Call Using TEMS

9.3.1 Making Test Call Using TEMS

This section describes how to make a test call using a TEMS and a PC with TEMS software. The test confirms that all TSs on all TRXs work properly.

The test record should be completed during the test. *See Section 9.4.2 Filling in the Test Record on page 171*.

1. Connect the TEMS cable between the TEMS and the PC COM port 1 on the PC containing TEMS software.

2. Start the TEMS and the TEMS software.

For more information on the TEMS and TEMS software, *see* :

TEMS Investigation GSM Manual LZT 108 2684

3. In the **Externals** menu, select **Enable Connections**. In the **External Connection** window, define the external connections according to *the table below.*

Table 56 Defining the External Connections

Definition	Port
MS1 Port	COM1
MS2 Port	N/A
Position Port	N/A

4. In the **Control** menu, select **Test of TCH**. Enter the following parameters:
   - Telephone number
   - Frequency (ARCFN)
   - Broadcast Channel (BCCH)
   - Frequency for the Traffic Channel (TCH)

5. Select the TSs used for traffic and click on **Add**. The BCCH and SDCCH channels are used for signalling and do not carry traffic. Do not make test calls on these TSs.

   Repeat this procedure for each TRX.

6. Click on the **Start** button. The TEMS now makes a test call on all selected TSs. For each TS, verify the speech quality and write "Pass" or "Fail" in the test record. *See Section 9.4.2 Filling in the Test Record on page 171*.

9.3.2 Making Diversity Test Call

This section describes how to make a diversity test call. The test confirms that both RXD A and RXD B work properly.

Note: If antenna diversity is not supported, do not make a diversity test call.

1. Wait for the BSC operator to configure RXD=A.
2. Request the BSC operator to block all TRXs except the one being tested and check that BCCH and SDCCH are configured.
3. Make a test call from the TEMS.
4. Request the BSC operator to check that the TCH being tested is busy. Check the speech quality, and write "Pass" or "Fail" in the test record. *See Section 9.4.2 Filling in the Test Record on page 171*.
5. Terminate the call.
6. Request the BSC to check that the tested TCH is released.
7. Repeat steps 2 to 6 for all TRXs in the cell.
8. Wait for the BSC operator to configure RXD=B.

9. Request the BSC operator to block all TRXs except for the one being tested, and check that BCCH and SDCCH are configured.
10. Make a test call from the TEMS.
11. Request the BSC operator to check that the TCH being tested is busy. Verify the speech quality and write "Pass" or "Fail" in the test record. *See Section 9.4.2 Filling in the Test Record on page 171*.
12. Terminate the call.
13. Request the BSC to check that the tested TCH is released.
14. Repeat steps 9 to 13 for each TRX in the cell.
15. Wait for the BSC operator to restore the cell.

9.3.3 Making Test Call from the Fixed Network

This section describes how to make a test call from the fixed network. The test confirms that the cell is available from the fixed network.

1. Request the BSC operator to configure a TRX with BCCH and SDCCH.
2. Request the BSC commissioning staff to make a call from a fixed network phone to the TEMS.
3. Request the BSC operator to check that the TCH being tested is busy and verify the ARFCN and the TS displayed in the TEMS. Verify the speech quality and write "Pass" or "Fail" in the test record. *See Section 9.4.2 Filling in the Test Record on page 171*.
4. Terminate the call.

9.3.4 Making Handover Test Call

This section describes how to make a handover test call. The purpose of the test is to verify that handover between cells works properly and that the coverage of the cell is in accordance with the cell planning. If no handover takes place at cell borders, then the BSC personnel must be contacted.

Note: The handover test call must be made at least 50 m (164 feet) from the antenna system.

1. Make a test call using TEMS and a PC containing TEMS software.
2. Move from one cell to another and verify that the call is not disconnected.
3. In the **Log** menu on the PC, select **Start Logging**. Give the log a unique name and select a destination for the log to be saved.
4. In the **Monitor** menu, select the **Status information** menu and **Serving + neighbouring cell**.

5. Monitor the signal strength (RxLev) and move through the cells to verify that handover takes place between cells at the cell borders. *See figure below*.

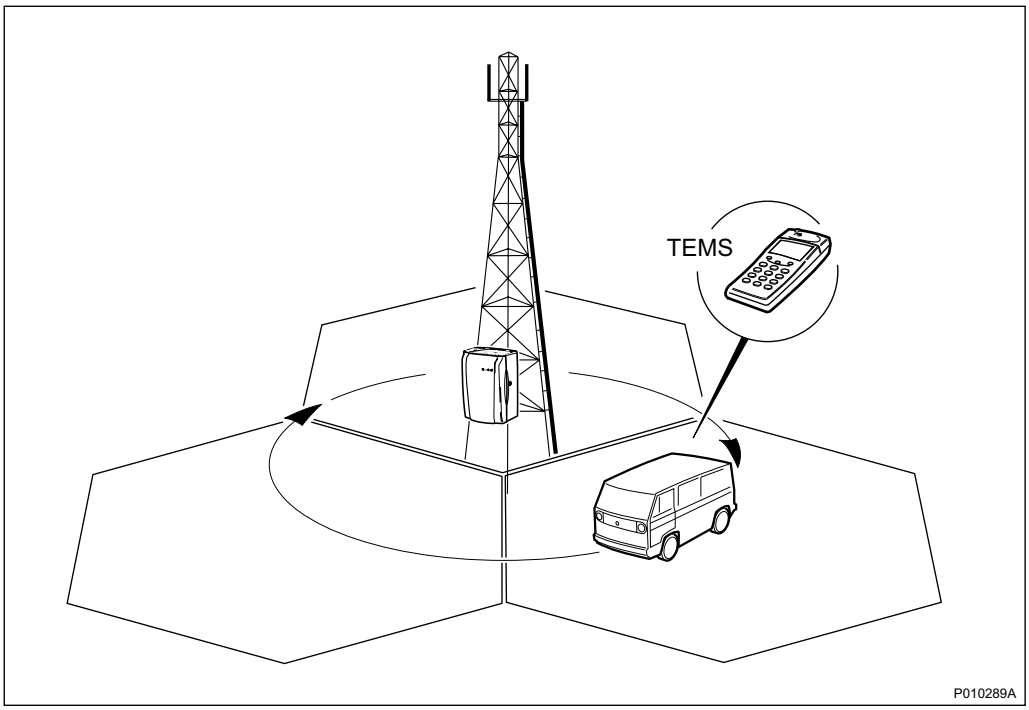


Figure 69 Verifying that Handover Takes Place at the Cell Borders

6. Write "Pass" or "Fail" in the test record. *See Section 9.4.2 Filling in the Test Record on page 171*.

7. Terminate the call and stop the log.

9.4 Performing Concluding Routines

This section describes the actions to be taken before leaving the site, and the test record to be completed during the tests.

9.4.1 Checking the RRU, IXU, and PSTU (Optional) Indicators

This section describes how to check that the RRU, IXU, and PSTU (optional) indicators show the correct status, when the RBS is connected to the BSC and is fully operational. The check should be performed before leaving the site.

1. Check that the indicators on the RRU(s), IXU, and PSTU (optional) have the status shown in the tables below:

Table 57 RRU Indicators After Site Integration

RRU Indicator	State
Fault	Off
Operational	On
Local	Off
RF off	Off
AC power on	On(1)
DC power on	On(1)
RRU temp.	Off

(1) Depending on power system configuration.

Table 58 IXU Indicators After Site Integration

IXU Indicator	State
Fault	Off
Operational	On
Local	Off
RBS fault	Off
External alarm	Off
AC power on	On(1)
DC power on	On(1)
IXU temp.	Off
Transmission OK	On(2)

(1) Depending on power system configuration.
(2) A, B, C and/or D, depending on transmission configuration.

Table 59 PSTU Indicators After Site Integration

PSTU Indicator	State
Fault	Off
Operational	On
Synchronized	On(1)
10/100Base-T	On(2)
100Base-LX10	On(3)
Transmission OK	Off(4)

(1) If the PSTU is used as the synchronization source. Otherwise, the indicator is off.
(2) When traffic is active on the electrical Ethernet link.
(3) When traffic is active on the optical Ethernet link.
(4) Ports A–D.

9.4.2 Filling in the Test Record

This section contains the test record to be filled in during the integration and testing of the RBS.

RBS Site Integration GSM -

Date:	Site Name:
Site No.:	Cell Configuration:
RBS Type:	Tester's Name:

Transmission Test:

Port A	Port C	Port B	Port D

Test Call Using TEMS:

TRX	Cell ID	ARFCN	BSIC	TS0	TS1	TS2	TS3	TS4	TS5	TS6	TS7
0											
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											

Diversity Test Call (if Applicable):

RXD	TRX0	TRX1	TRX2	TRX3	TRX4	TRX5	TRX6	TRX7	TRX8	TRX9	TRX10	TRX11
A												
B												

Test Call from Fixed Network:

Pass/Fail	

Handover Test Call:

A to B	B to C	C to A	A to C	C to B	B to A

Remarks: _____

_____

_____

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Figure 70 Test Record for RBS Site Integration