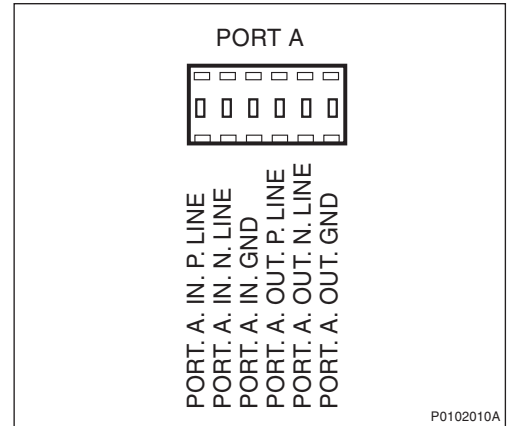


Connecting PCM Twisted Pair 100/120 Ω

- 1 Connect the twisted pairs to P.LINE and N.LINE.



- 2 Earth the cables according to the following instruction:

Inner and outer shield Connect the inner shield to the terminator block, and the outer shield to the cable gland, see *Figure 24* on page 61.

Outer shield only Fit the shield to the cable gland, see *Figure 25* on page 62.

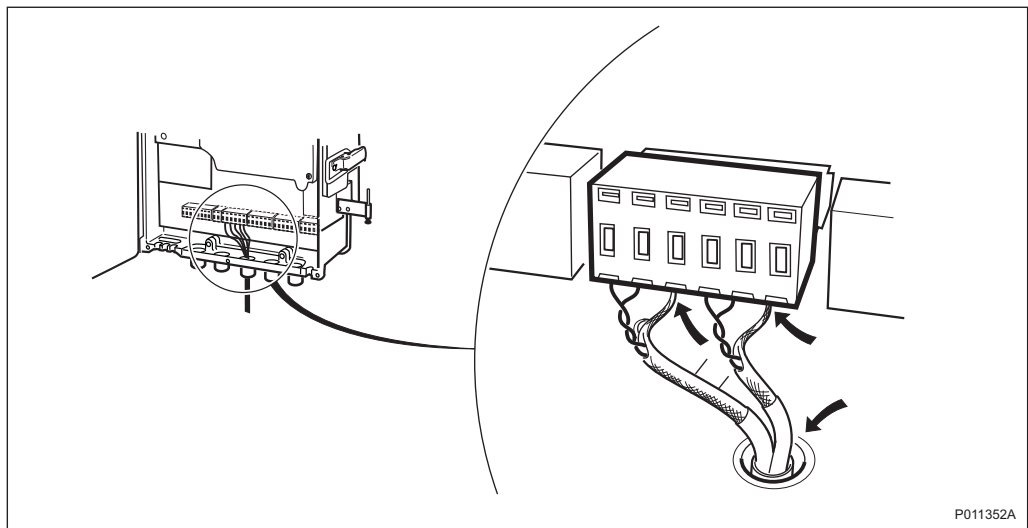


Figure 24 Earthing Inner and Outer Shield

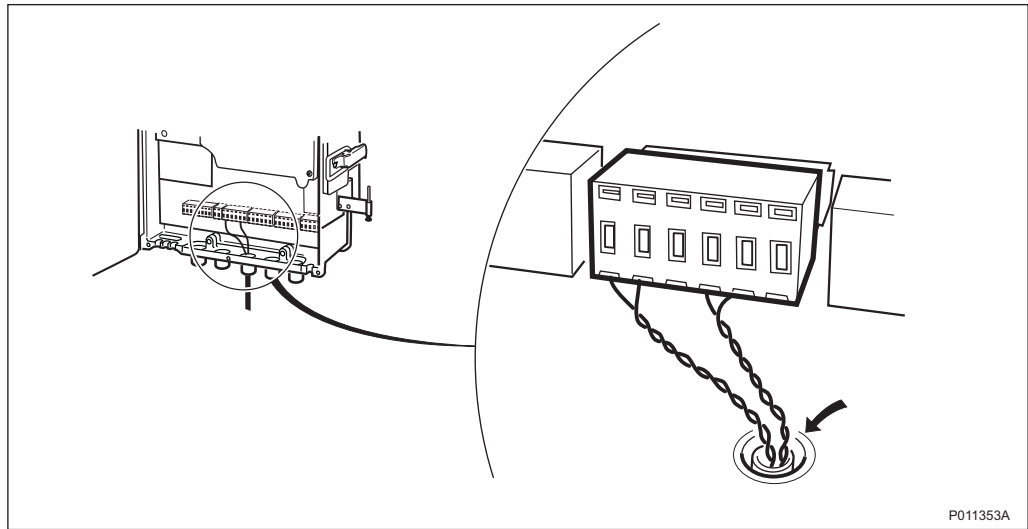


Figure 25 Earthing Outer Shield Only

5.4.7 Installing the RRU

This section describes how to install the Remote Radio Unit (RRU).

Note: To avoid damage, do not place the RRU on its connectors, see *Figure below*.

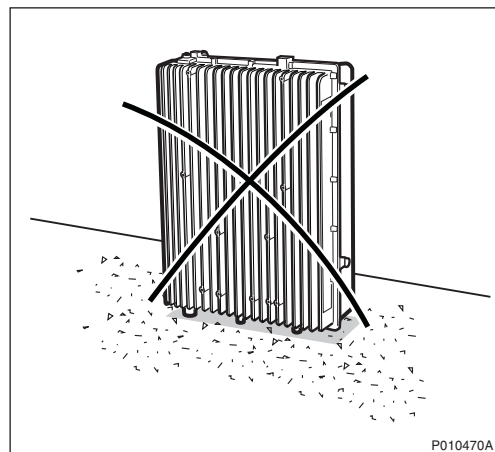


Figure 26 Do Not Place the RRU on its Connectors

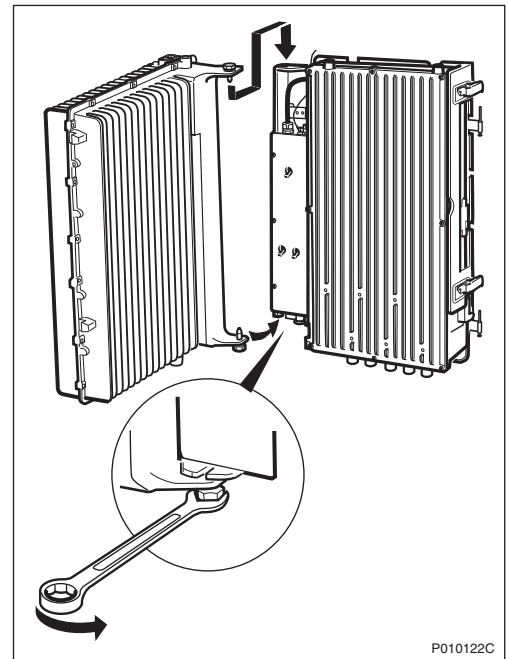
Note: Do not install any equipment on the RRU before mounting it on the MBU.



Caution!

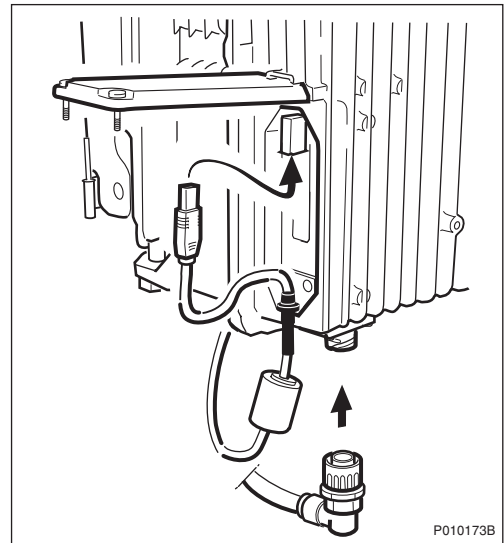
The equipment is heavy. Lifting the equipment without the aid of a lifting device can cause injury.

- 1 Hang the RRU onto the upper hinge. Position the lower hinge and tighten the screw.

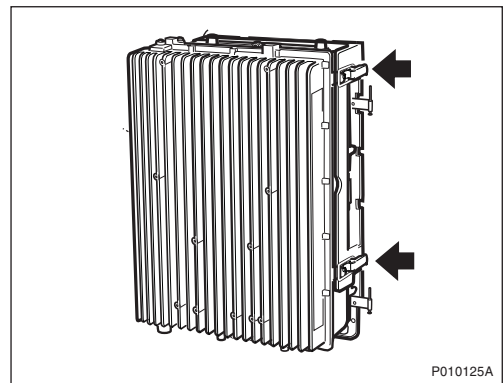


- 2 Remove the protection cover under the RRU.

- 3 Open the left side cover on the RRU, connect the Y link cable and close the cover. Connect the AC/DC cable.



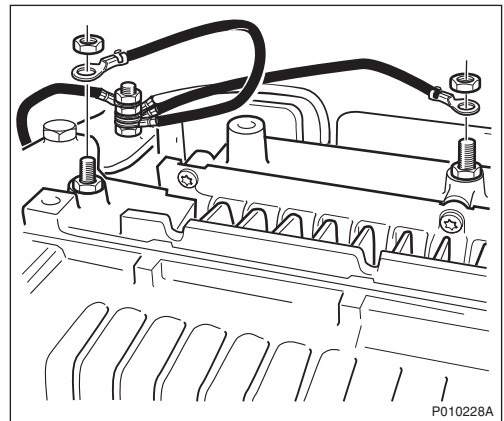
- 4 Close the RRU using the clasps.



5.4.8 Connecting Earth Cables

This section describes how to connect the earth cables to the RRU and the IXU.

- 1 Connect the earth cables from the earthing point to both IXU (master) and RRU.

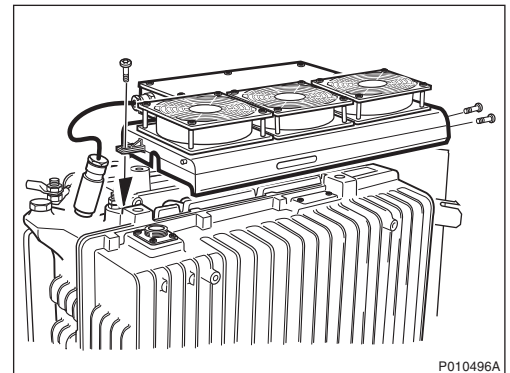


Note: If an Omni Antenna is to be installed on the RRU, the RRU earthing cable must be connected after the omni antenna bracket has been mounted.

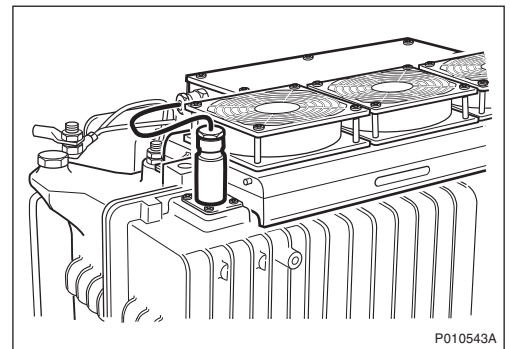
5.4.9 Installing the Fan Unit (Optional)

This section describes how to install the fan unit.

- 1 Install the fan on top of the RRU and fasten the three screws.



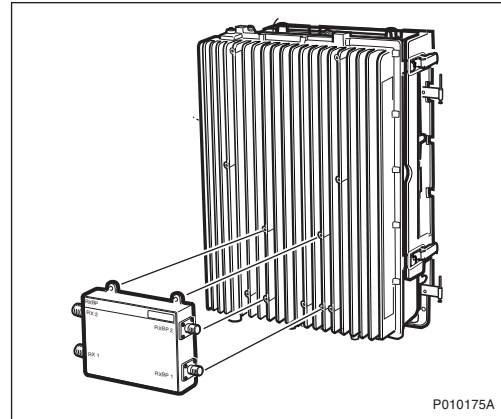
- 2 Connect the power cable to the RRU.



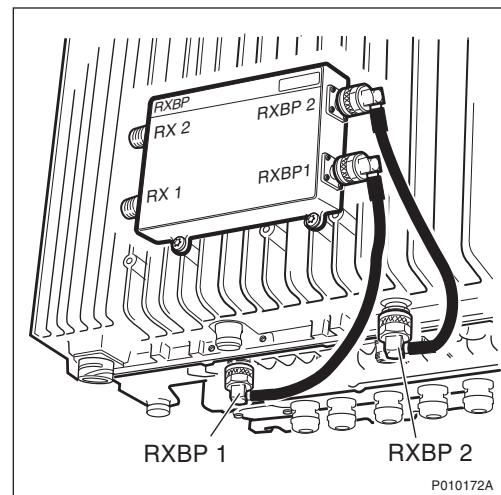
5.4.10 Installing RXBP (Optional)

This section describes how to install the Receiver Band Pass filter (RXBP) on the RRU and how to connect the cables.

- 1 Install the RXBP on the RRU and tighten the screws.



- 2 Connect the first cable from connection port **RXBP 1** on the RXBP to connection port **RXBP 1** on the RRU. Connect the other cable from connection port **RXBP 2** on the RXBP to **RXBP 2** on the RRU.



- 3 Connect the RX antenna cables to connection port **RX 1** and **RX 2** on the RXBP, and tighten with the appropriate torque wrench. See *Table 9 on page 41*.

For more information about antenna connections, see:



Site Installation Documentation

5.4.11 Installing the Integral Omni Antenna (If Applicable)

This section describes how to install the integral Omni Antenna on the RRU.

1. Remove the RRU earthing cable if it has been previously installed. See *Section 5.4.8 Connecting Earth Cables on page 64*
2. Mount the Omni Antenna bracket on top of the RRU, and tighten the captive screws.

3. Install the RRU earthing cable.

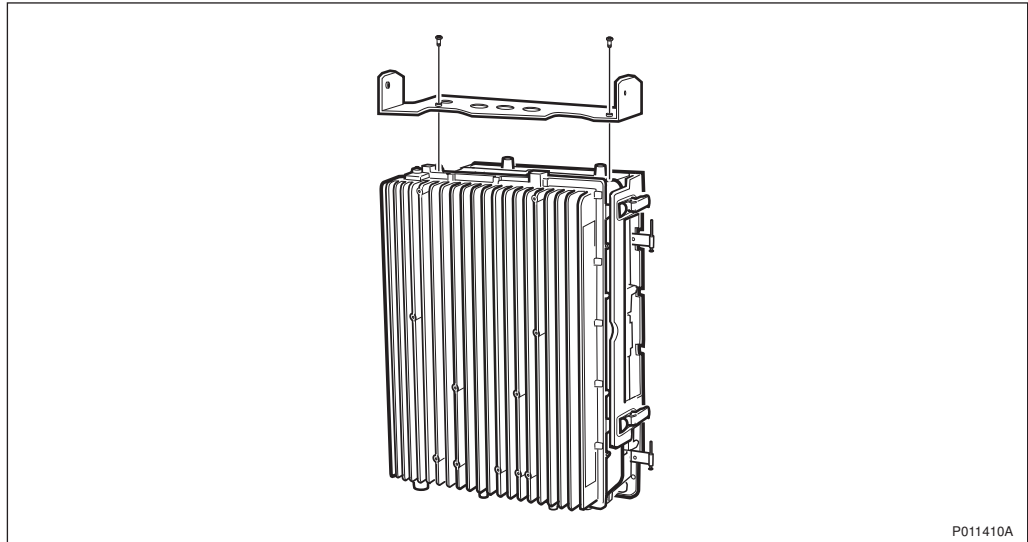


Figure 27 Mounting the Antenna Bracket

4. Attach the antenna on the bracket. Use the two captive screws on each side of the antenna.
5. Route and fasten the antenna cable with two clamps on the right side of the RRU.
6. Secure the antenna with the sunshield, see Section 5.4.15 on page 69.

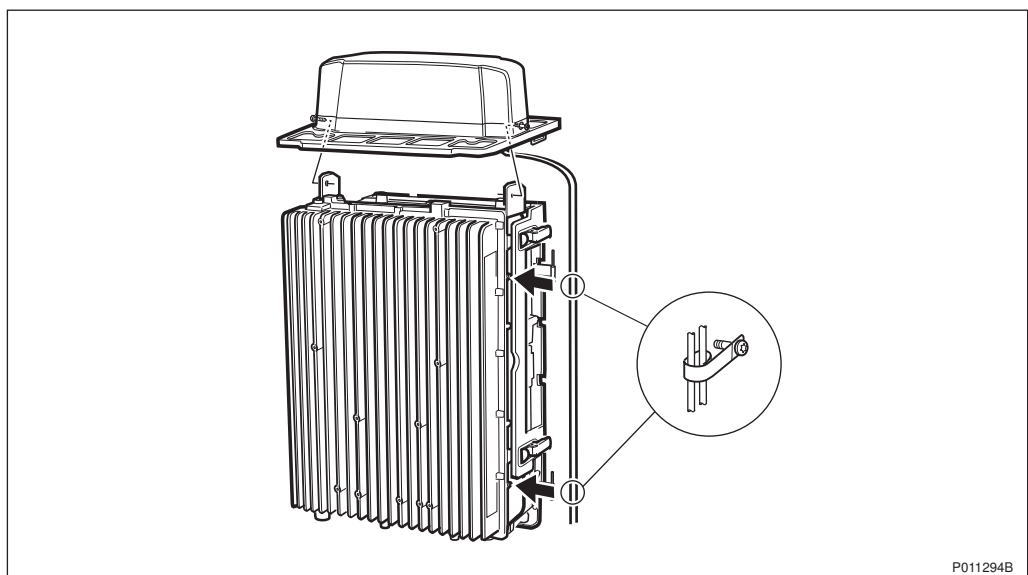


Figure 28 Installing the Omni Antenna

5.4.12 Installing the Integral Sector Antenna (If Applicable)

This section describes how to install a Sector Antenna on the RRU.

1. Attach the Sector Antenna on the front of the RRU. Secure it with four screws.

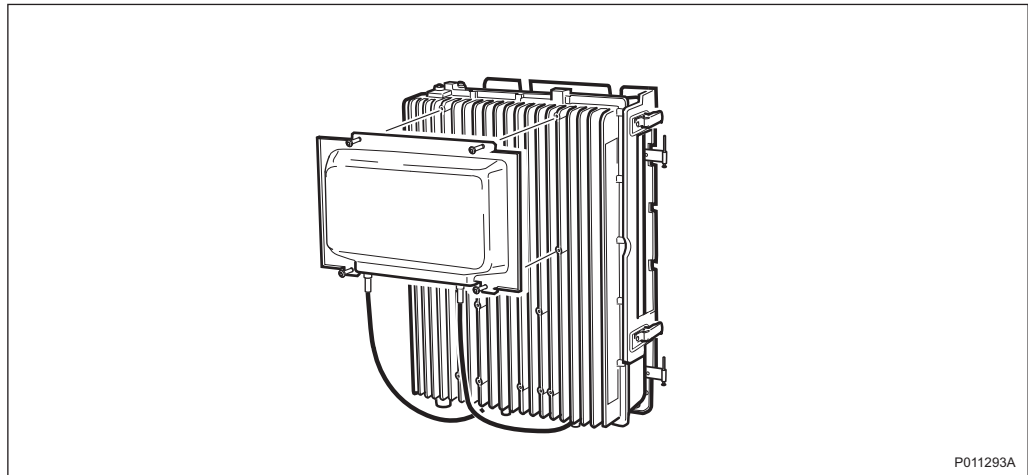
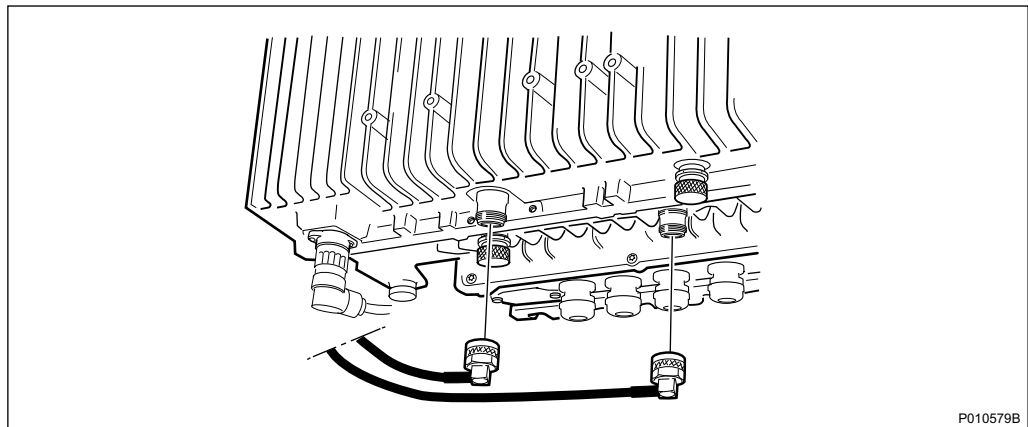


Figure 29 Installing the Sector Antenna

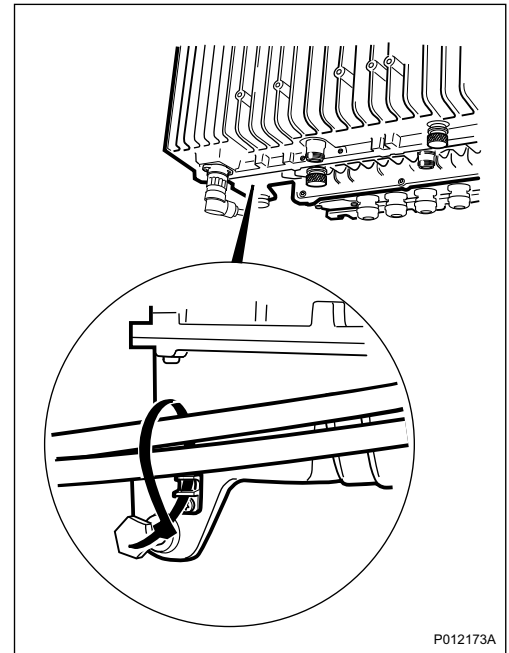
5.4.13 Connecting RBS Antenna Cables

This section describes how to connect antenna cables when a MCB or integral antenna is not used.

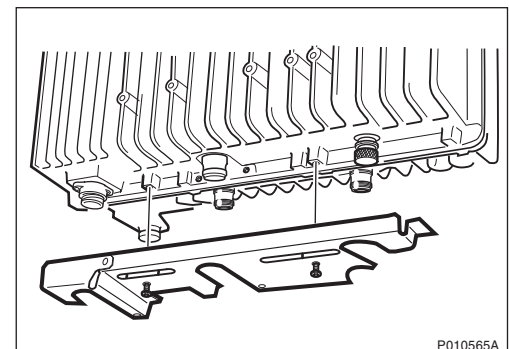
- 1 Connect the RBS jumpers to connection port **TX(/RX) 1** and **TX(/RX) 2**, and tighten with the appropriate torque wrench. See *Table 9 on page 41*.



- 2 Strap the cables using the appropriate cable tie anchor.



- 3 Install the protective cover under the RRU.



5.4.14 Testing the Installation

The RBS is now ready for the site installation tests.

The site installation tests should be performed directly after the completion of the RBS installation, see *Chapter Site Installation Tests*.

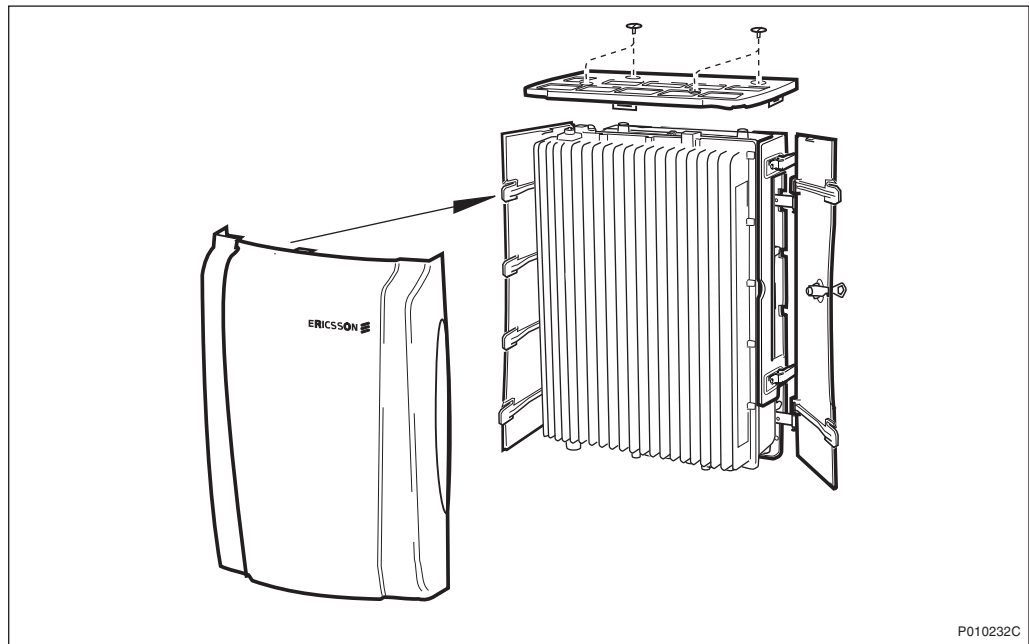
After the installation and integration testing is completed, return to *Section 5.4.15 on page 69*.

5.4.15 Installing the Sunshields

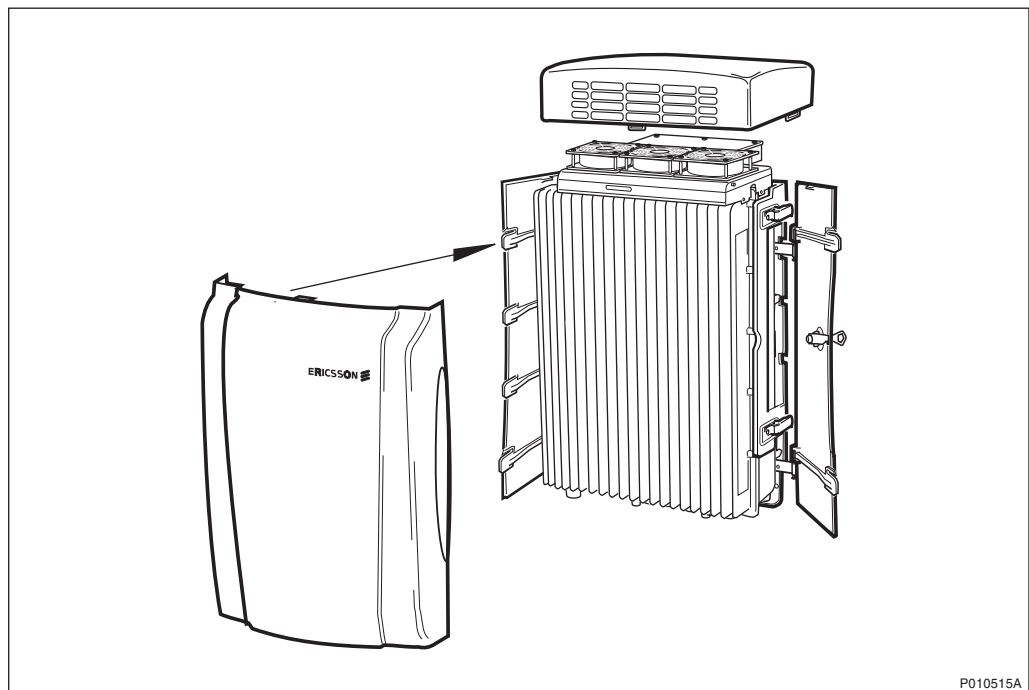
This section describes how to install the sunshields.

Different sunshields are used depending on whether or not components are installed on the front of the RRU.

1. If the fan unit or integral Omni Antenna are not used, install the top sunshield and fasten two screws either to the RRU or the IXU. See *Figure below*.



2. If the fan unit is used, install the fan cover on top of the RRU. See *Figure below*.



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

5.4.16 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 11 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.

5.4.16.1 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.

5.4.16.2 Performing Final Checks

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

Table 12 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.

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 the following GSM 800/1900 antenna systems:

- Passive antenna system (no TMA)
- Antenna system with Dual Duplex Tower Mounted Amplifier (ddTMA)

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
- S235A for GSM 1900
- S251A/B for GSM 800/1900
- S331A/B for GSM 800/1900

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

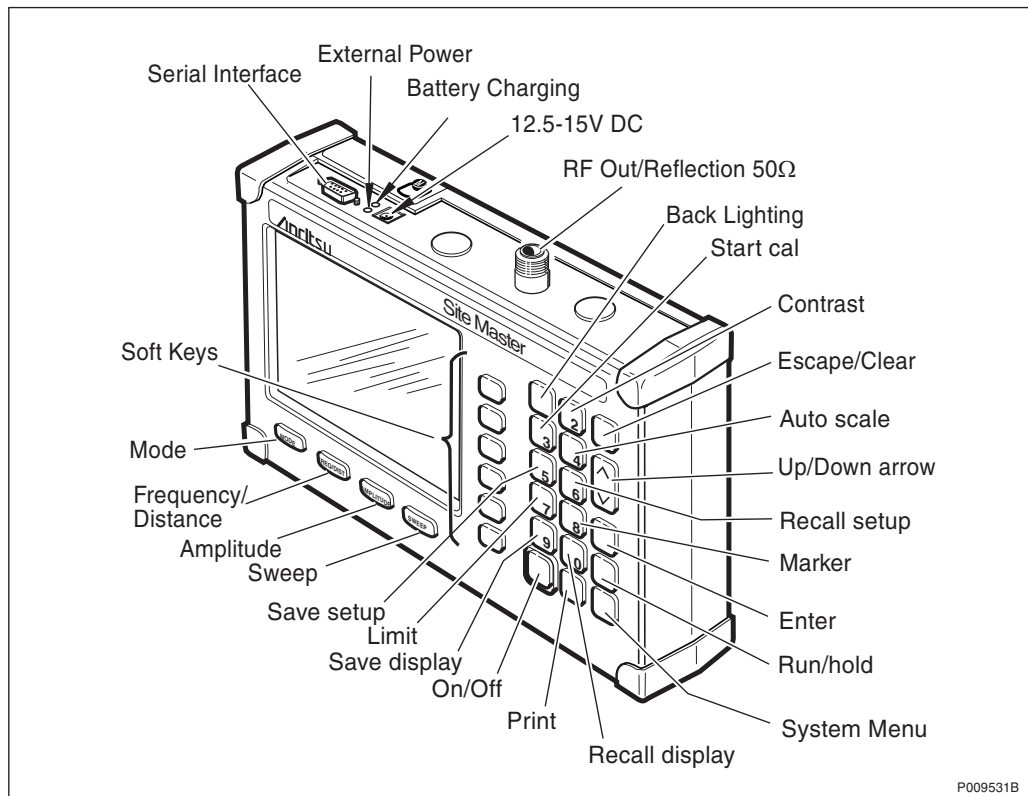


Figure 30 Anritsu Site Master S331C

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 Anritsu Site Master, see:



Anritsu Site Master User's Guide

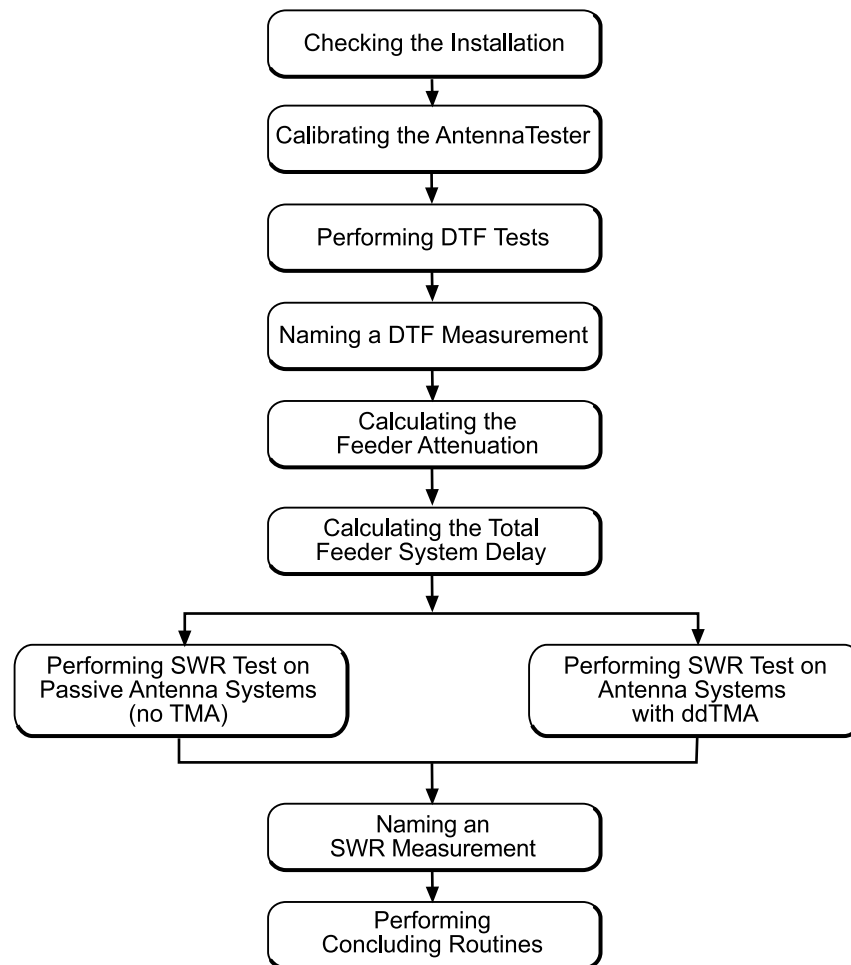
Preconditions

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, feeder cables with jumpers and, if applicable, ddTMA is complete prior to testing. Ericsson recommends that the connectors are not covered 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.



P010283B

Figure 31 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.

If TMAs are used, check that bias injectors are installed on each feeder.

7. Record remarks, if any, in the test record and forward them to the person responsible for the site installation.

Note: If a TMA is used, mixing the jumpers or feeder cables damages the TMA. Verify that the cable markings are correct.

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 13 Start and Stop Frequencies

System	Start Freq. (MHz)	Stop Freq. (MHz)
GSM 800	800	1000
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.

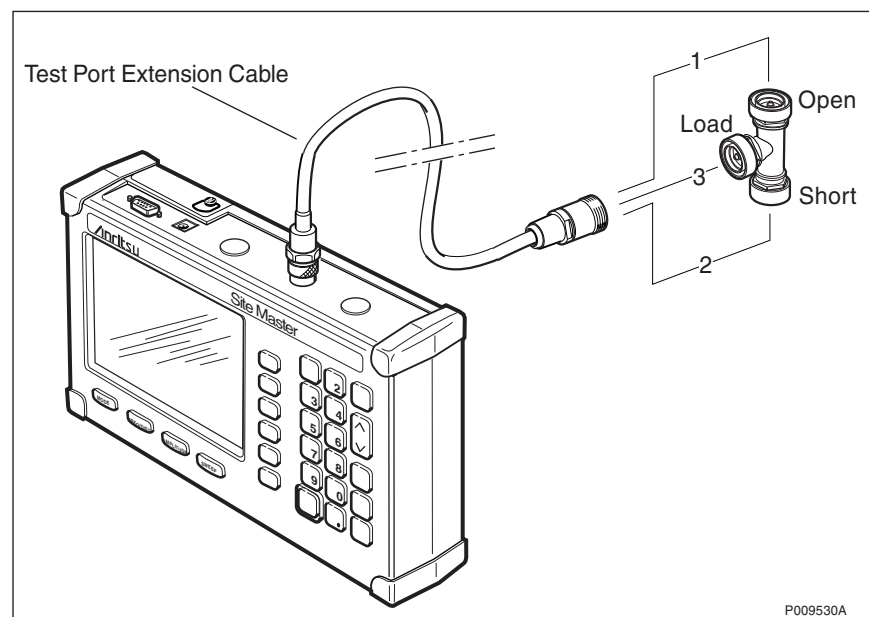


Figure 32 Connecting the Open/Short/Load

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 14 Velocity Factor and Attenuation for Different Cables

Feeder Type Andrew	Velocity Factor (PROP VEL)	Attenuation, dB/m (CABLE LOSS)	
		GSM 800	GSM 1900
1/4" LDF1	0.86	0.124	0.195
1/4" FSJ1 (flex)	0.84	0.179	0.278
3/8" LDF2	0.88	0.106	0.166
3/8" FSJ2 (flex)	0.83	0.121	0.191
1/2" LDF4	0.88	0.066	0.104
1/2" FSJ4 (flex)	0.81	0.107	0.171

Table 14 Velocity Factor and Attenuation for Different Cables

Feeder Type Andrew	Velocity Factor (PROP VEL)	Attenuation, dB/m (CABLE LOSS)	
		GSM 800	GSM 1900
7/8" LDF5	0.89	0.037	0.060
1 1/4" LDF6	0.89	0.027	0.043
1 5/8" LDF7	0.88	0.022	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. This test 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 and TMAs 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. The test setups are described for the following antenna systems:

- Passive antenna systems (no TMA)
- Antenna systems with ddTMA

Connecting Test Setup for Passive Antenna Systems (No TMA)

This section describes how to connect the DTF test setup for passive antenna systems (without TMA).

1. Connect the 50 Ω standard load to the antenna jumper. *See figure below.*
2. Connect the test equipment to the RBS jumper. *See figure below.*

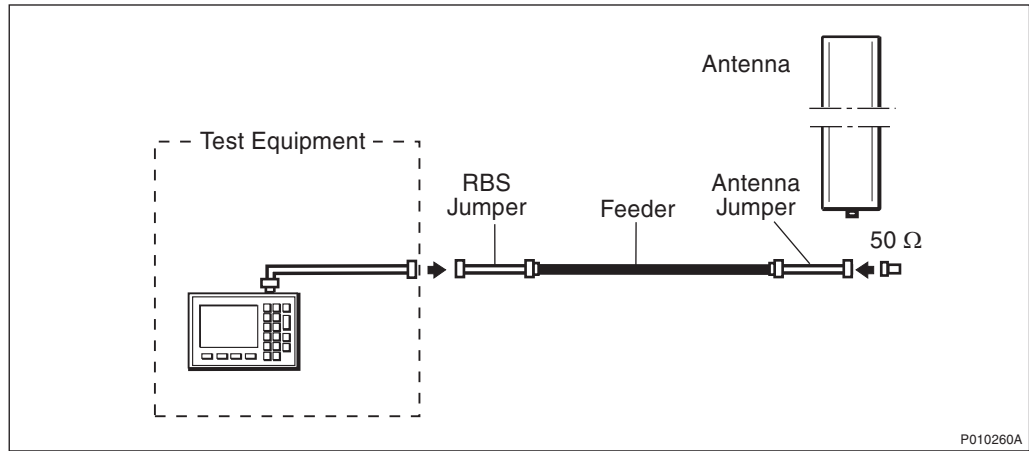


Figure 33 DTF Test Setup for Passive Antenna Systems (No TMA)

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

Connecting Test Setup for Antenna Systems with ddTMA

1. Connect the 50 Ω standard load to the TMA jumper. See figure below.
2. Connect the test equipment to the RBS jumper. See figure below.

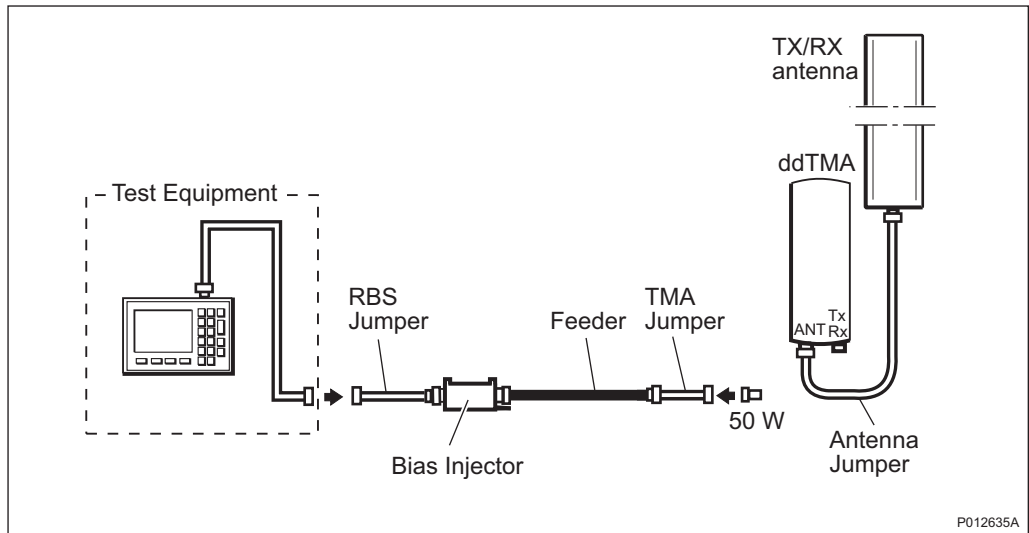


Figure 34 DTF Test Setup for Antenna Systems with ddTMA

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 76.

2. Ensure that the test equipment is connected according to *Section 6.3.1 Connecting DTF Test Setup on page 79*.
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 20 on page 99*, if necessary.

Example of an Acceptable DTF Measurement

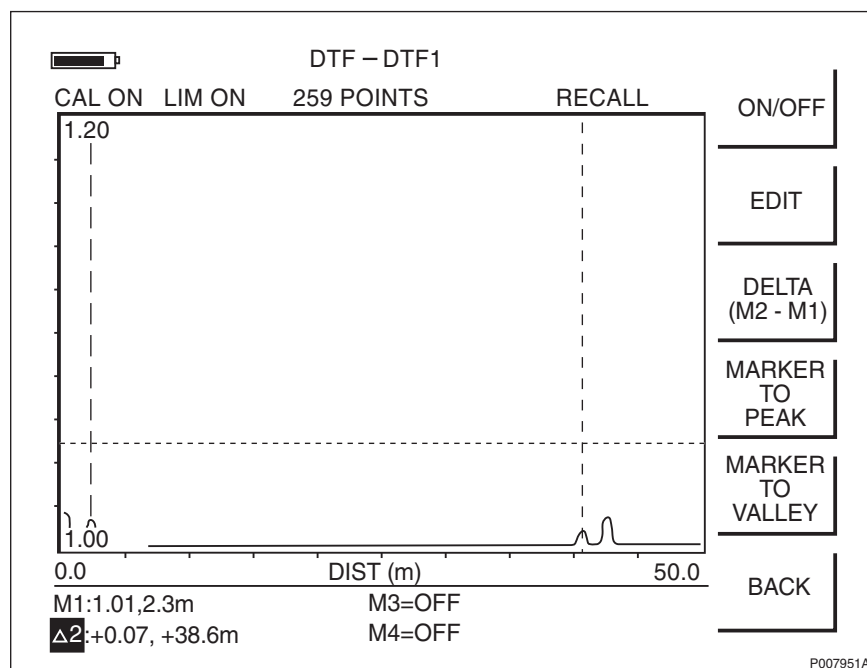


Figure 35 Example of an Acceptable DTF Measurement

Example of an Unacceptable DTF Measurement

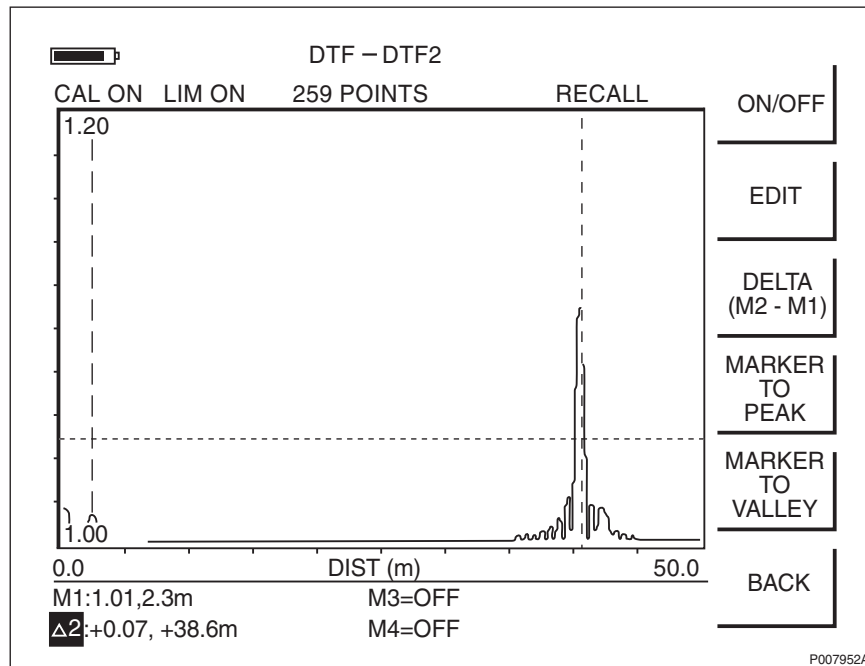


Figure 36 Example of an Unacceptable DTF Measurement

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 80.

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.

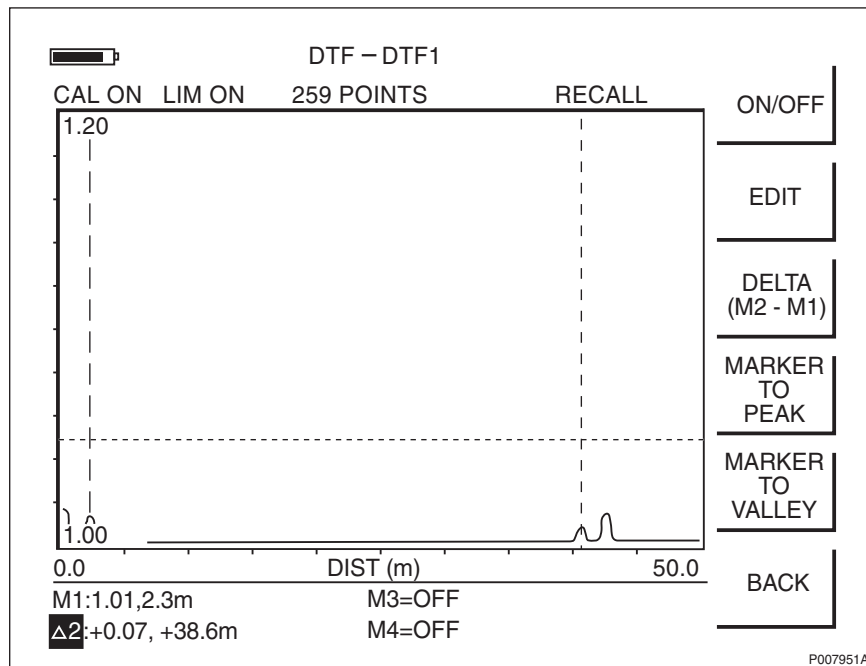


Figure 37 Placing the M1 and M2 Markers

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 Δ_2 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 83*. 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 82*.
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 metres by the attenuation per metre.
3. Add the attenuations for the feeder and the jumpers, see *Table 15 on page 85*
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 15 Attenuation for Different Cables

Feeder Type Andrew	Attenuation, dB/m (CABLE LOSS)	
	GSM 800	GSM 1900
1/4" LDF1	0.124	0.195
1/4" FSJ1 (flex)	0.179	0.278
3/8" LDF2	0.106	0.166
3/8" FSJ2 (flex)	0.121	0.191
1/2" LDF4	0.066	0.104
1/2" FSJ4 (flex)	0.107	0.171
7/8" LDF5	0.037	0.060
1 1/4" LDF6	0.027	0.043
1 5/8" LDF7	0.022	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 1900)

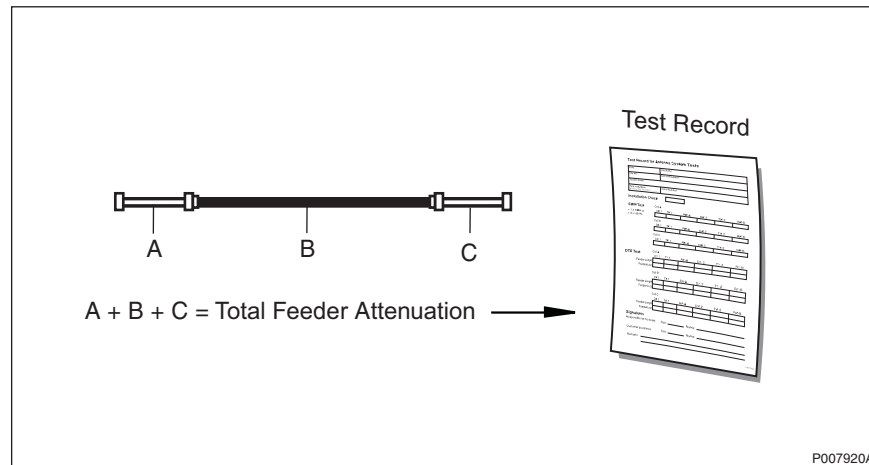


Figure 38 Example of Calculating the Total Feeder Attenuation

- See the figure for feeders and jumpers mentioned in the example.
The frequency band is GSM 1900.
1. The feeder length has been measured to 63 m.
 2. The cables used are:
 - RBS jumper (A):
 - Andrew 1/2" LDF4
 - Length: 2 m
 - The attenuation is 0.104 dB/m.
 - See the table.
 - The total cable attenuation for the RBS jumper is:

$$2 \times 0.104 = 0.21 \text{ dB}$$
 - Feeder (B):
 - Andrew 7/8" LDF5
 - Length: 63 m
 - The attenuation is 0.060 dB/m.
 - See the table.
 - The total cable attenuation for the antenna feeder is:

$$63 \times 0.060 = 3.78 \text{ dB}$$
 - Antenna jumper (C):
 - Andrew 1/2" LDF4
 - Length: 2 m
 - The attenuation is 0.104 dB/m.
 - See the table.
 - The total cable attenuation for the antenna jumper is:

$$2 \times 0.104 = 0.21 \text{ dB}$$
 3. The total attenuation is:

$$0.21 + 3.78 + 0.21 = 4.20 \text{ dB}$$
 4. 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 82*.
2. Find the delay value (ns/m) for the cable type in *Table 15 on page 85*. 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 16 Delay Specifications for Different Cables

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

Example of Calculating the Total Feeder Delay

See figure above for feeders and jumpers mentioned in the example.

The feeder length has been measured to 40 m.

1. The cables used are:

RBS jumper (A):

Andrew 3/8" LDF2

Length: 2 m

The delay per meter is 3.8 ns.

See the table in this chapter.

The delay for the antenna jumper is:

$$2 \times 3.8 = 7.6 \text{ ns}$$

Feeder (B):

Andrew 1/2" LDF4

Length: 40 m

The delay per meter is 3.8 ns.

See the table in this chapter.

The feeder delay is: $40 \times 3.8 = 152 \text{ ns}$.

RBS jumper (C):

Andrew 3/8" LDF2

Length: 2 m

The delay per meter is 3.8 ns.

See the table in this chapter.

The delay for the antenna jumper is:

$$2 \times 3.8 = 7.6 \text{ ns}$$

2. The total delay is:

$$7.6 + 152 + 7.6 = 167.2 \approx 167 \text{ ns.}$$

3. Enter the results in the test record.

Example 3 Calculating the Total Feeder Delay

6.7 Performing SWR Test on Passive Antenna Systems (Without TMA)

The purpose of the 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 for passive antenna systems (without TMA).

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

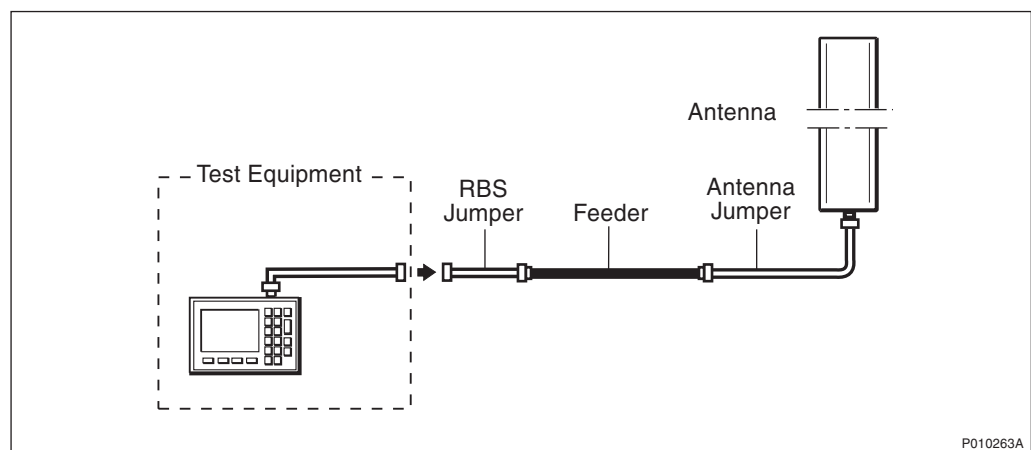


Figure 39 Test Setup for Passive Antenna Systems (No TMA)

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 76*.
2. Ensure that the test equipment is connected according to *Section 6.7.1 Connecting SWR Test Setup on page 89*.
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: Ensure that Limit is in ON-mode by pressing the **LIMIT ON/OFF** soft key.

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

Table 17 Measurement Frequency Range for Passive Antenna Systems (No TMA)

System	Start Freq. MHz	Stop Freq. MHz
GSM 800	824	894
GSM 1900	1850	1990

- Check that no SWR levels are over 1.4 (= 15.6 dB RL) between the frequencies stated in the table above. For conversion between VSWR and Return Loss see *Table 20 on page 99*. Enter the *test result* in the test record. For examples of acceptable and unacceptable waveforms, see figures below.
- Create a unique trace name in accordance with *Section 6.9 Naming an SWR Measurement on page 95*. Save the measurement by pressing the **SAVE DISPLAY** key. Type in the trace name using the alphanumeric soft keys, and press **ENTER**.
- Repeat the SWR test for each feeder on the site.

Example of an Acceptable SWR Measurement

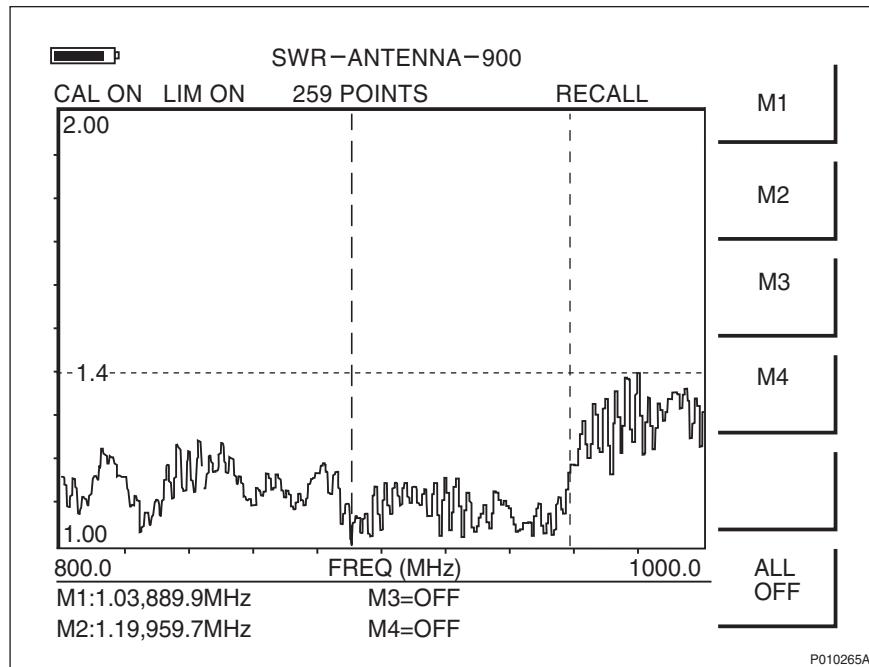


Figure 40 Example of an Acceptable SWR Measurement, GSM 900, No TMA

Example of an Unacceptable SWR Measurement

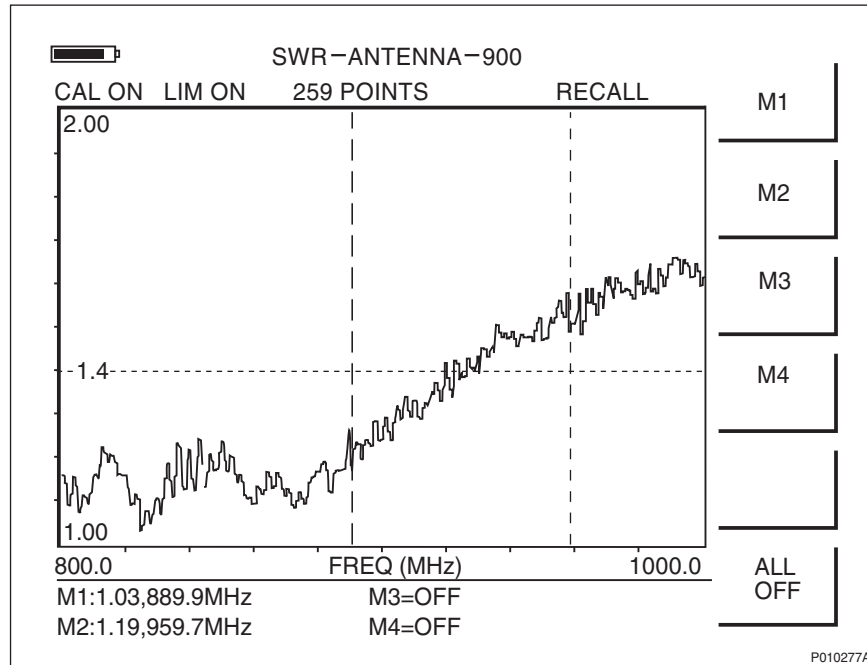


Figure 41 Example of an Unacceptable SWR Measurement, GSM 900, No TMA

6.8 Performing SWR Test on Antenna Systems with ddTMA

The purpose of the SWR test is to verify the antenna system 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.

6.8.1 Connecting SWR Test Setup

This section describes how to connect the SWR test setup for antenna systems with ddTMA.

Note: The ddTMA need not be powered-up in this test setup as only the downlink band is being tested.

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

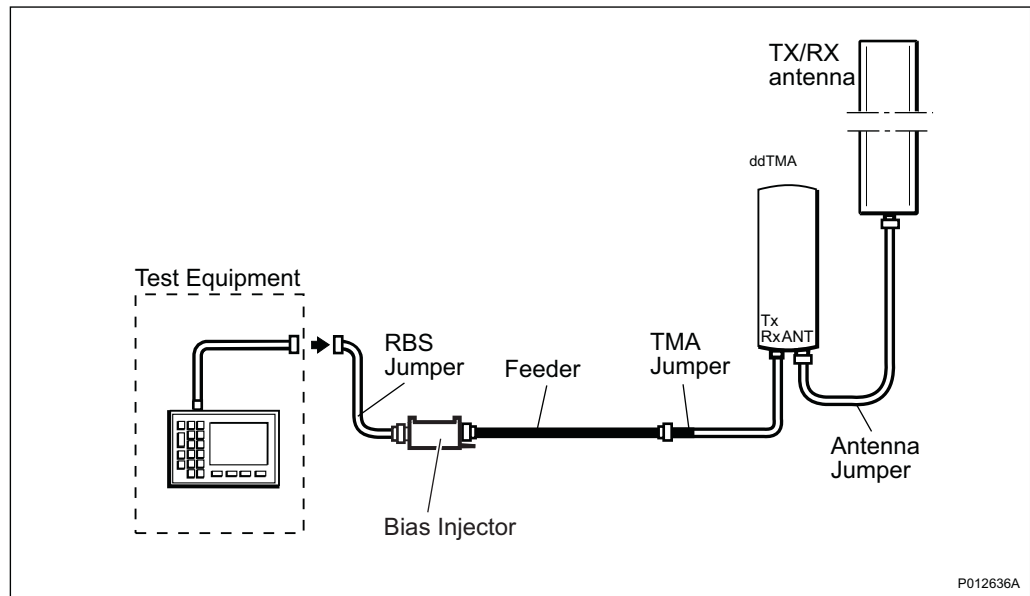


Figure 42 Test Setup for Antenna Systems with ddTMA

6.8.2 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 76*.
2. Ensure that the test equipment is connected according to *Section 6.8.1 on page 91*.
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 **1.5**, and press **ENTER**.

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

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

Table 18 Measurement Frequency Range for Antenna Systems with ddTMA

System	RX Band (on TMA Label)		TX Band (Measurement Frequency Range)	
	Start Freq. MHz	Stop Freq. MHz	Start Freq. MHz	Stop Freq. MHz
GSM 800	824	849	869	894
GSM 1900	1850	1910	1930	1990
	1850	1880	1930	1960
	1865	1895	1945	1975
	1880	1910	1960	1990

7. Check that no SWR levels are over 1.5 (= 14.0 dB RL) in the TX band, see table above. For conversion between SWR and Return Loss see *Table 18 on page 93*. Enter the *test result* in the test record. For examples of acceptable and unacceptable waveforms, see figures below.
8. Create a unique trace name in accordance with *Section 6.9 Naming an SWR Measurement on page 95*. 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

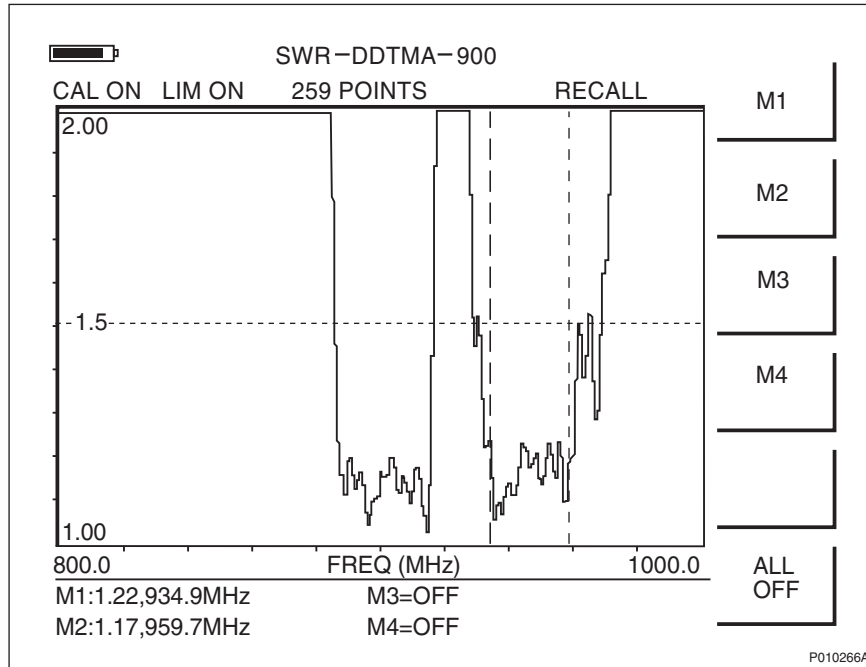


Figure 43 Example of an Acceptable SWR Measurement, GSM 900 with ddTMA

Example of an Unacceptable SWR Measurement

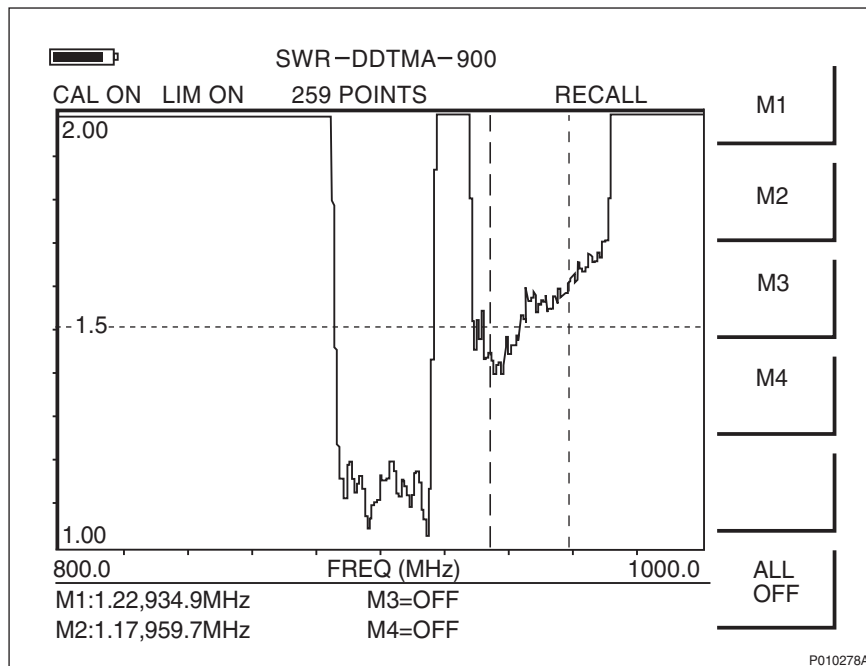


Figure 44 Example of an Unacceptable SWR Measurement, GSM 900 with ddTMA

6.9 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 DTF, so the name of the measurement is "SWRSOF007ADX1".

Example 4 Naming an SWR Measurement

6.10 Performing Concluding Routines

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

6.10.1 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

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

* If applicable

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

* If applicable

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

* If applicable

SWR Test

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

* If applicable

Cable Marking: _____

Signatures

Responsible for the Record Date: _____ Name: _____

Customer Acceptance Date: _____ Name: _____

Remarks _____

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Figure 45 Test Record for Antenna System Tests

6.10.3 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 19 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 <i>Site Installation Documentation</i> is completed with the test record and the test record supplements.	

6.11 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 20 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
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
- Chapter Safety Instructions has been read

7.1.1 Documentation

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

Table 21 Required Manual for Site Installation Tests

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

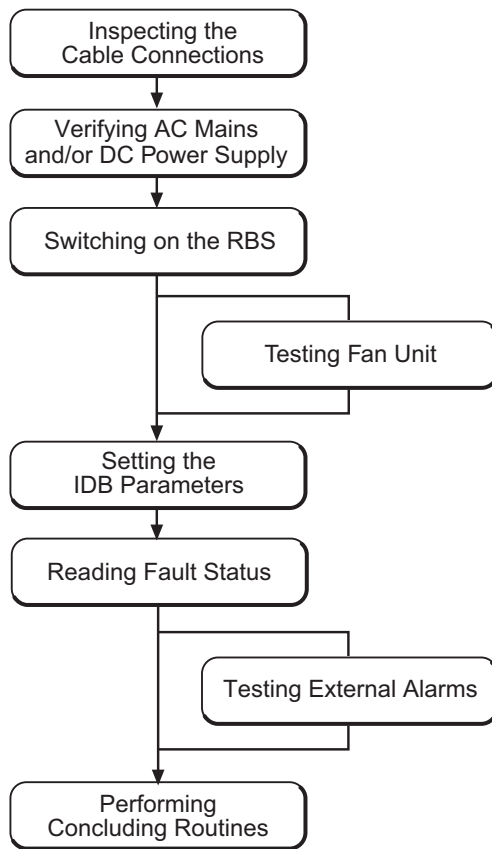
7.1.2 Before Starting Test Procedure

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.



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Figure 47 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 Checking 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.

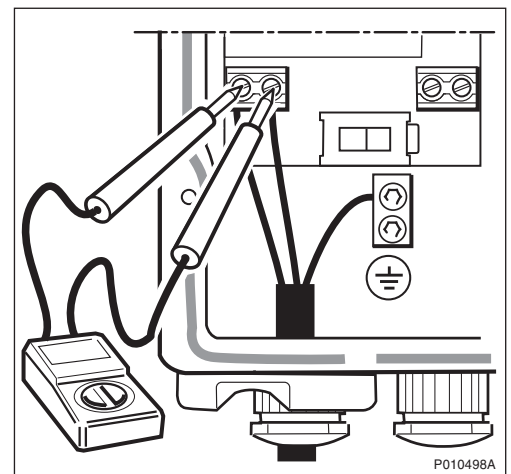


Danger!

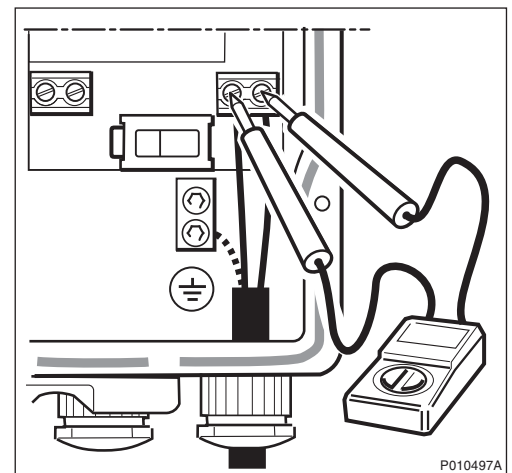
Electric shock risk. Avoid both direct and indirect contact with parts connected to mains power as this is likely to be fatal. Switch off the mains power before starting work.

1 Open the sunshields and the RRU, and remove the lid from the MBU.

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



3 If applicable, measure the incoming DC power to the RBS, using a multimeter. Check that the incoming DC power is between -40.5 and -60 V DC.



4 Put back the MBU lid and tighten the screws.

7.4 Switching on RBS

This section describes how to switch on the RBS.

- 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.

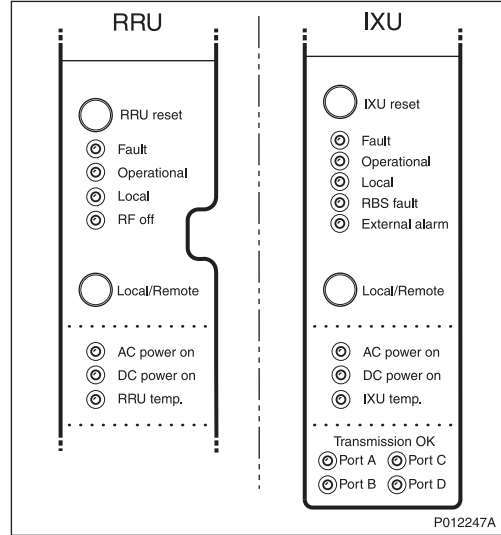


Table 22 RRU Indicators Before Setting the IDB Parameters

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

(1) Depending on power system configuration.

Table 23 IXU Indicators Before Setting the IDB Parameters

IXU	Status
Fault	Off
Operational	Off
Local	On
RBS fault	Off
External alarm	Off
AC power on	On ⁽¹⁾

Table 23 IXU Indicators Before Setting the IDB Parameters

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 60 minutes to warm up, during which time the IXU or RRU temperature indicator is on. The internal heater works only with an AC power supply.

3. If the Operational indicator on the RRU and/or IXU is flashing, SW is being downloaded. Wait until the indicator switches off 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).

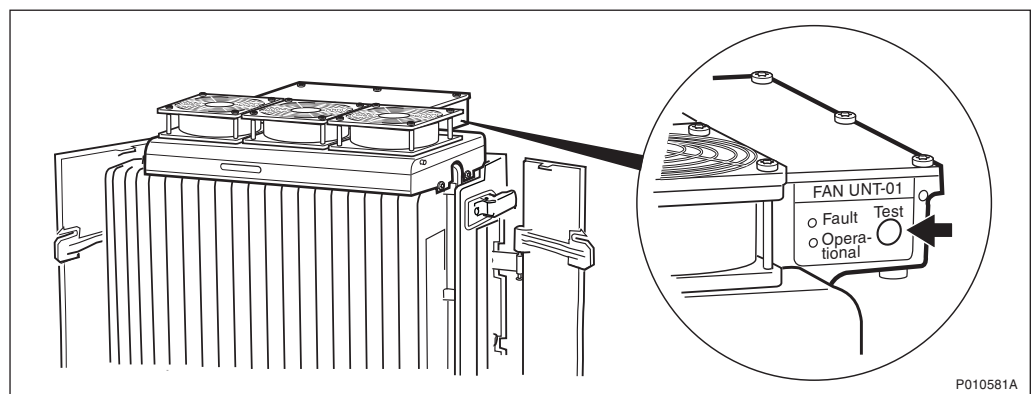


Figure 48 Location of Fan Unit Test Button

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 for approximately 5 seconds
4. Ensure that the indicator status of the fan unit is in accordance with the table below:

Table 24 Fan Unit Indicators After Test

Fan unit Indicator	Status
Fault	Off
Operational	On

- 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 information on the use of the OMT, see:

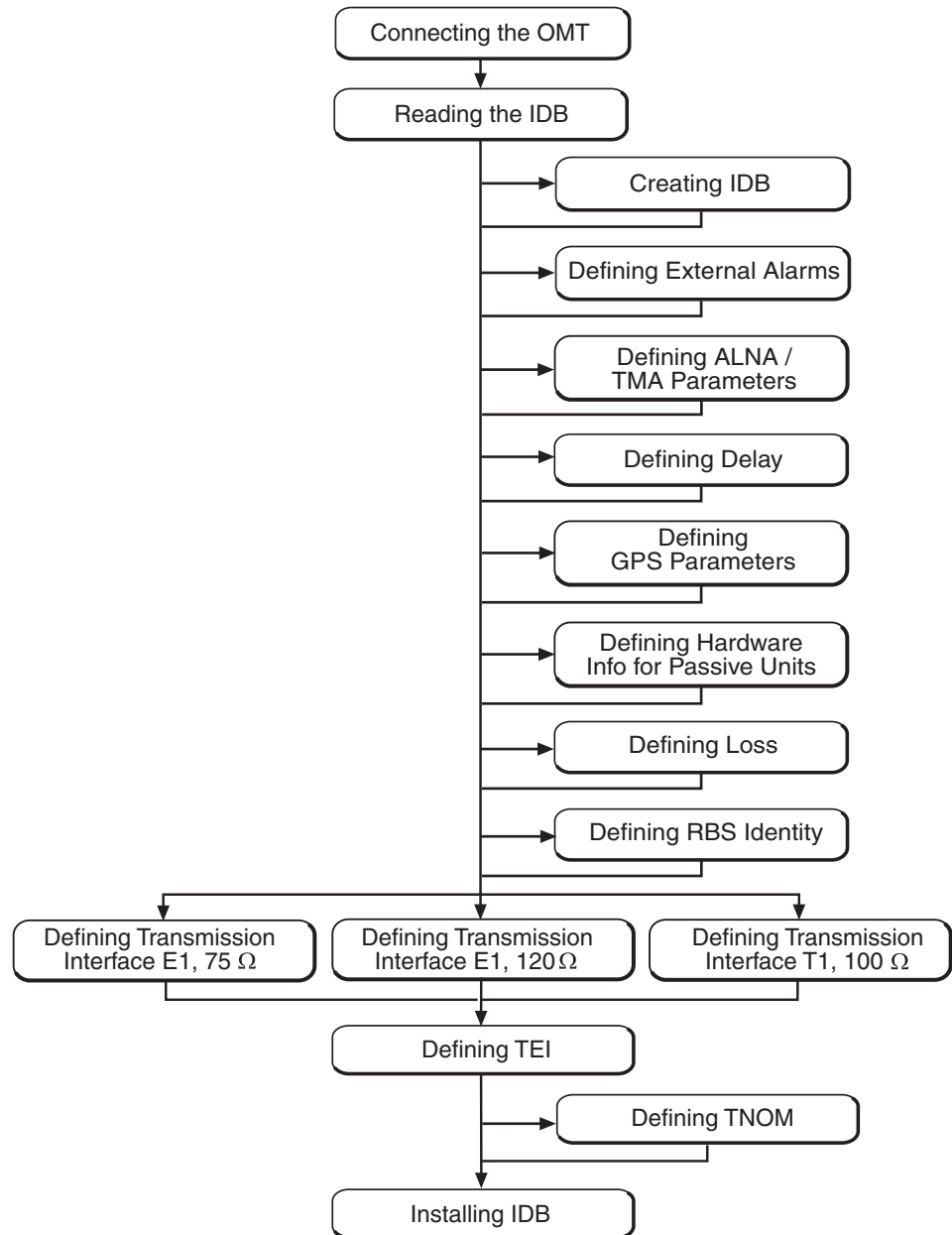


OMT User's Manual

EN/LZN 720 0001

Work Process for Setting IDB Parameters

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



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Figure 49 Work Process for Setting IDB Parameters

Note: The IDB parameter values required are found in:



Site Installation Documentation

7.6.1 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.

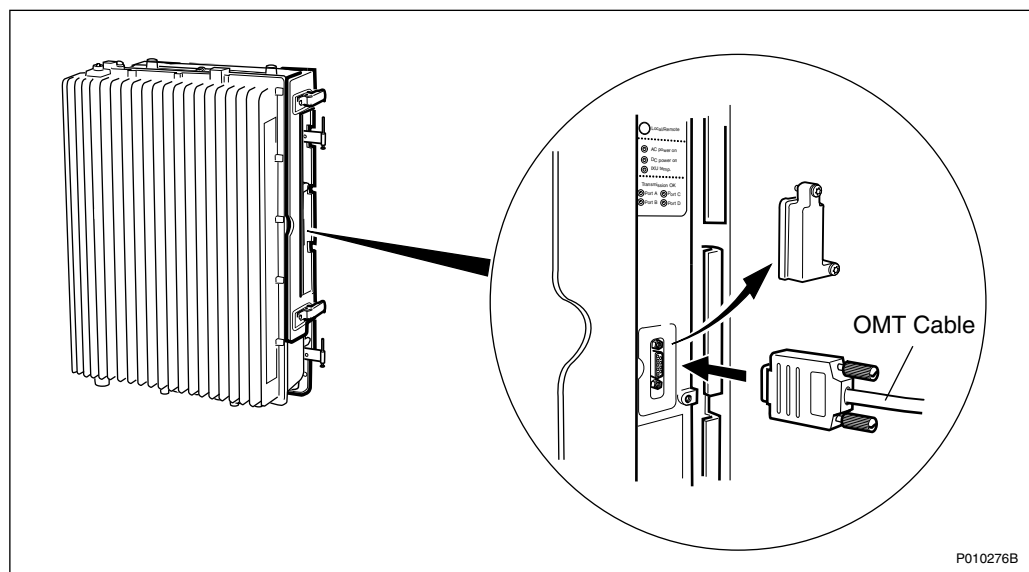


Figure 50 Connecting OMT to IXU

3. Start the OMT.

7.6.2 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, click **Connect** to connect the OMT logically to the RBS.
2. On the **Configuration** menu, click **Read IDB**.
3. On the **Configuration** menu, click **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 25 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 7.6.3 Creating IDB on page 109*.

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

- Alarm inlets (external alarms)
- ALNA/TMA parameters
- Delay
- GPS parameters
- Hardware Information
- Loss
- RBS Identity
- Transmission (PCM) parameters
- TEI value for IXU
- TNOM parameters

7.6.3

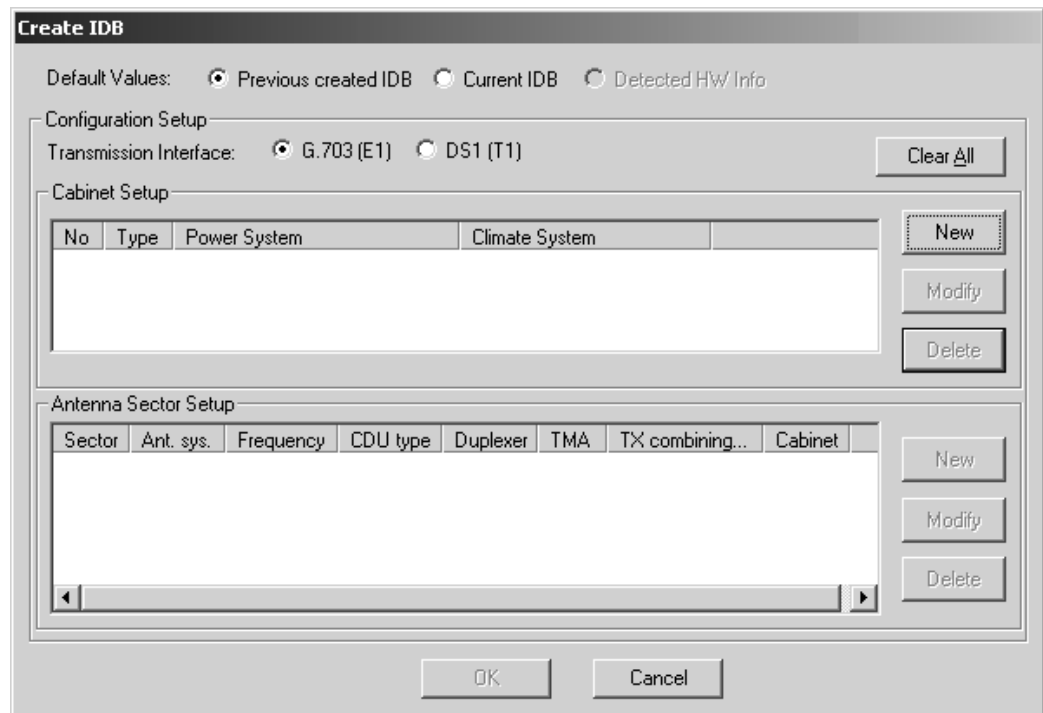
Creating IDB

This section describes how to define the configuration setup in the OMT. The OMT can detect the cabinet setup if the **Detected HW Information** checkbox in the **Create IDB** window is selected.

Note: The OMT must be logically connected to the RBS to be able to retrieve the HW information.

Defining Transmission Interface

1. On the **RBS 2000** menu, ensure that the OMT is logically disconnected from the RBS.
2. On the **Configuration** menu, click **Create IDB** to open the Create IDB window.
3. Select the transmission interface.



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Figure 51 Creating IDB

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 “2109”.
3. In the Define Master Cabinet Setup 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 4 to 9 to add another RRU cabinet to the configuration.

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 2109 has two TRX/RRU.

Example 1: For an RBS 2109 in a SCC = 1x4, define an RBS with two RRUs (two TRX/RRU) and then define one antenna sector with two antenna systems (RRUs).

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. Select "Yes" or "No" in the TMA dialog box, depending on whether or not TMA is used.
5. Click **OK**.
6. To define another antenna system within the same antenna sector, click **New** again.
7. Click **OK**, or repeat step 6 for adding more RRUs within the same antenna sector.
8. To define an antenna system in a new sector, repeat steps 1 to 7.
9. 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.

7.6.4 Defining External Alarms

This section describes how to define the external alarms, that is, customer-specific alarms, if applicable. See *Site Installation Documentation*.

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.

The screenshot shows a window titled "Define Alarm Inlets". It contains a list of alarm inlets under "Alarm Inlet Information". The first item, "0/1 External Alarm, Breaking, ID=0, Level 1, DOOR OPEN", is selected. Below this list is a section titled "Information for the Selected Alarm Inlet". This section includes a dropdown for "Inlet Usage" set to "External Alarm", a sub-section "External Alarms" with a "Type" dropdown set to "Breaking", an "Id" dropdown set to "0", a "Severity" dropdown set to "Level 1", and a "Comment" text box containing "DOOR OPEN". At the bottom of this section is an "Apply" button. At the very bottom of the window are "OK", "Reset", and "Cancel" buttons.

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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 issued when the alarm loop closes) or "Breaking" (the alarm is issued 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 issued.

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 EBB and PBC should be defined according to the tables below.

ddTMA

Table 26 External Alarm Definitions for ddTMA

Alarm Inlet	Inlet Usage	Type	Id	Severity	Comment
0/3	External Alarm	Breaking	(1)	Level 2	TMA equipment 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-01

Table 27 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 28 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 29 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.

7.6.5 Defining ALNA/TMA Parameters

This section describes how to set the ALNA/TMA parameters (if applicable).

The TMA parameters must be set when a TMA is connected and the characteristics of the TMA are different from the default values in the IDB files in the OMT. If any parameter is missing, then the default values should be used.

1. In the **Configuration** menu, select **Define** and **ALNA/TMA**.
2. In the Define ALNA/TMA window, select the appropriate TMA and click **Run**.
3. Set the parameters listed below. See *the installation instructions for the TMA*.

Note: TMA Loss = - TMA Gain.

- TX Group Delay (in ns)
 - RX Group Delay (in ns)
 - Loss (in dB) (TMA Loss = - TMA Gain)
 - RX Frequency Range (in MHz)
4. Click **OK** when all parameters are set.
 5. Repeat steps 2 to 4 for all TMAs. Close the Define ALNA/TMA window.

7.6.6 Defining Delay

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

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) 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 define the GPS parameters. To be able to use GPS as a synchronisation source, the RBS must be equipped with a GPS receiver.

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.*

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.

The screenshot shows a dialog box titled "Define TIM 0 HW Info". Inside the dialog, there is a section labeled "Hardware Information" which contains four text input fields: "Product No.", "Serial No.", "HW Rev.", and "Comment". Below these fields are three buttons: "OK", "Reset", and "Cancel".

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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.

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.

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 unique RBS name.
3. In the RBS description field, enter the site name or the location of the site (maximum of 100 characters).
4. Click **OK**.

7.6.11 Defining 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 30 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

7.6.12

Defining Transmission Interface E1, 120 Ω

This section describes how to define the PCM parameters for transmission interface E1, 120 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 31 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.

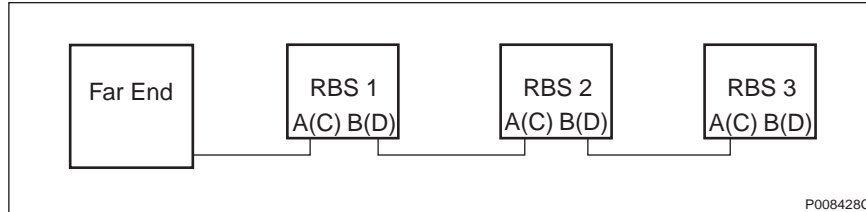


Figure 53 System View for Transmission Interface E1, 120 Ω

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

Cable attenuation = cable length x 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.

Example of Receiver Sensitivity Parameter Calculation for E1, 120 Ω

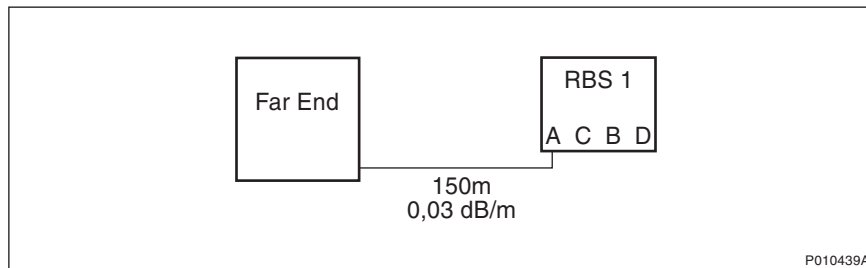


Figure 54 Example of Receiver Sensitivity Parameter Calculation for E1, 120 Ω

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:
 $150 \text{ m} \times 0.03 \text{ dB/m} = 4.5 \text{ dB}$
2. Set Receiver Sensitivity A for the RBS to "Short haul".
3. Set Receiver Sensitivity C for the RBS to "Short haul" (not connected).
4. Set Receiver Sensitivity B for the RBS to "Short haul" (not connected).
5. Set Receiver Sensitivity D for the RBS to "Short haul" (not connected).

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

7.6.13

Defining Transmission Interface T1, 100 Ω

This section describes how to define parameters for transmission interface T1, 100 Ω . 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 32 *Selecting Section for Defining T1, Transmission Interface Type Known*

If the transmission interface type is...		then...
DSX-1		go to <i>Section Defining LBO Parameters as Short Haul on Page 120</i> .
DS1 and...	the signal level at the customer interface and the cable attenuation is known	go to <i>Section Defining LBO Parameters as Long Haul Manually on Page 123</i> .
	only the maximum input signal level at the far end is known	go to <i>Section Defining LBO Parameters as Long Haul Automatically on Page 127</i> .
	neither the signal level at the customer interface nor the cable attenuation are known	go to <i>Section Defining LBO Parameters when Transmission Characteristics are Unknown on Page 133</i> .

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 33 *Selecting Section for Defining T1, Cable Length Known*

If...		then...
the cable length is less than 655 feet		go to <i>Section Defining LBO Parameters as Short Haul on Page 120.</i>
the cable length is more than 655 feet and...	the signal level at the customer interface and the cable attenuation is known	go to <i>Section Defining LBO Parameters as Long Haul Manually on Page 123.</i>
	only the maximum input signal level at the far end is known	go to <i>Section Defining LBO Parameters as Long Haul Automatically on Page 127.</i>
	neither the signal level at the customer interface nor the cable attenuation are known	go to <i>Section Defining LBO Parameters when Transmission Characteristics are Unknown on Page 133.</i>

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

Table 34 *Selecting Section for Defining T1, Cable Length Unknown*

If...	then...
there is no information about the cable length	go to <i>Section Defining LBO Parameters when Transmission Characteristics are Unknown on Page 133.</i>

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. See *figure below*.

Define PCM

Transmission Configuration Parameters

Transmission Interface: **DS1 (T1)**

Network Topology: **Stand alone**

Sync Source: PCM A PCM B PCM C PCM D

G703 (E1)

CRC-4: []

Spare Bits (sa4-sa8): []

Receiver Sensitivity A: []

Receiver Sensitivity B: []

Receiver Sensitivity C: []

Receiver Sensitivity D: []

DS1 (T1)

LBO A: **Long h., 0 dB**

LBO B: **Long h., 0 dB**

LBO C: **Long h., 0 dB**

LBO D: **Long h., 0 dB**

FDL Use: **Only for RAI**

OK Reset Cancel

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Figure 55 Defining Transmission Parameters

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

Table 35 PCM Parameter Settings for Transmission Interface T1, Short Haul

PCM Parameter	Setting
Sync Source	See Site Installation Documentation
Transmission Interface	DS1(T1)
Network Topology	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.

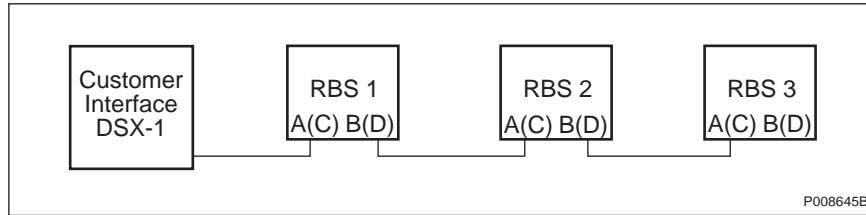


Figure 56 System View for Transmission Interface T1, Short Haul

1. Determine 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, then calculate the attenuation of the entire RBS chain, since LBO A (C) is determined by the total attenuation of the chain. LBO B (D) is determined by the total attenuation to the last RBS in the chain.

If the cable length is not known, then 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 36 Setting LBO Parameters to Short Haul in OMT

Cable Length		LBO Setting (in the OMT)
Feet	Metres	
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”.

Example of an LBO Parameters Calculation for Short Haul

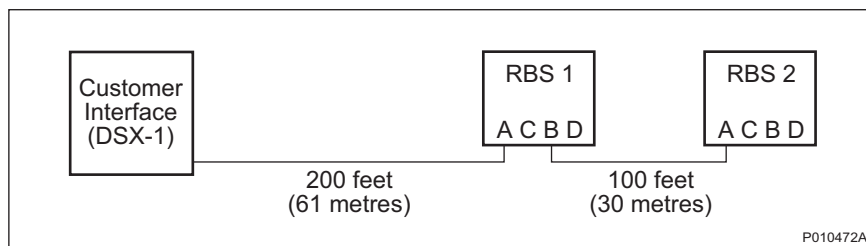


Figure 57 Calculating LBO Parameters for Short Haul

In this example, customer interface (DSX-1), RBS 1 and RBS 2 refer to the figure above.

RBS 1:

The cable length between RBS 1 and the customer interface (DSX-1) is 200 feet (61 m).

1. Set LBO A for RBS 1 to "Short h., 133 - 266 feet".
See the table above
2. Set LBO B for RBS 1 to "Short h., 0 - 133 feet".
3. Set LBO C and D (not connected) for RBS 1 to "Short h., 0 - 133 feet".

RBS 2:

The cable length between RBS 2 and the customer interface (DSX-1) is 300 feet (200 + 100 feet) (91 m).

1. Set LBO A for RBS 2 to "Short h., 266 - 399 feet".
See the table above.
2. Set LBO B, C and D (not connected) for RBS 2 to "Short h., 0 - 133 feet".

Example 6 Defining LBO Parameters as 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 are 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.*

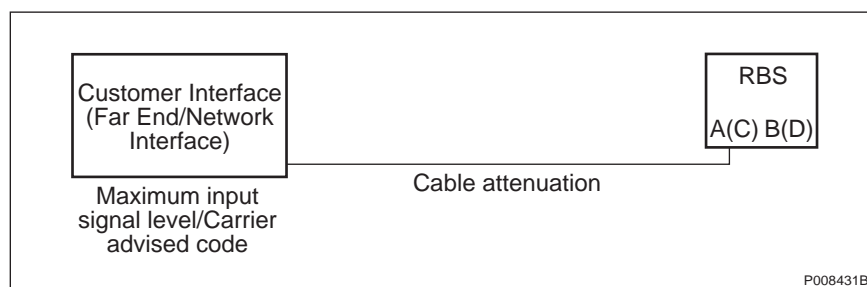
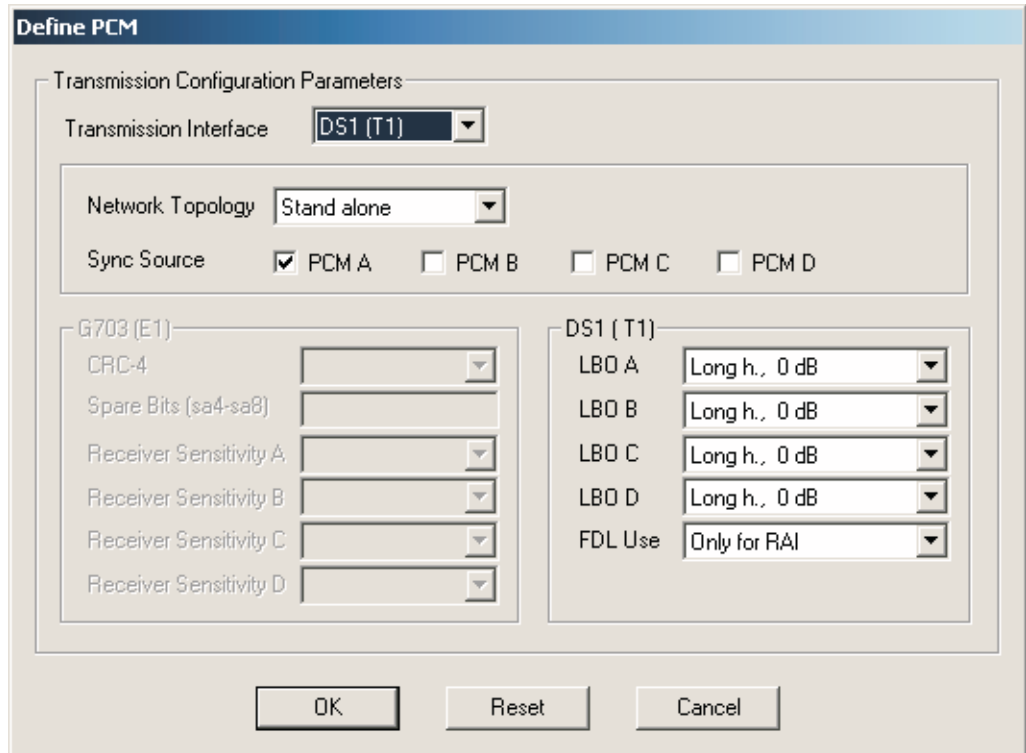


Figure 58 System Parameters for Defining LBO Parameters to Long Haul

1. On the **Configuration** menu, click **Define** and **PCM** to open the Define PCM window. *See figure below.*



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Figure 59 Defining Transmission Parameters

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

Table 37 Manual PCM Parameter 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 set the LBO parameters manually to long haul.

Note: It is also possible to use ports C and D as a multidrop pair.

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

If multidrop is used, then calculate the attenuation of the entire RBS chain, since LBO A (C) is determined by the total attenuation of the chain.

Table 38 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 39 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 is used, then 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”.

Example of a Manual LBO Parameters Calculation for Long Haul

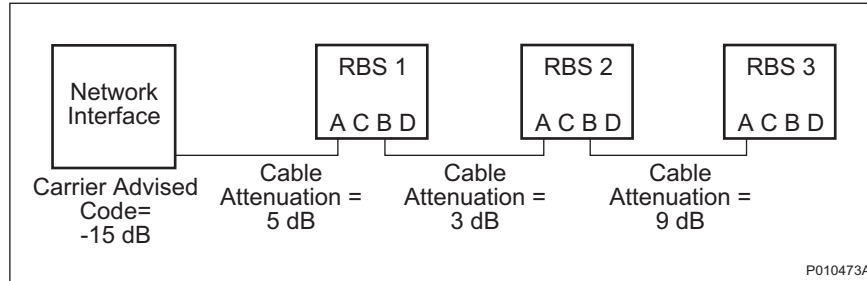


Figure 60 Calculating LBO Parameters Manually for Long Haul

In this example, network interface, RBS 1, RBS 2 and RBS 3 refer to the figure above.

RBS 1:

Carrier advised code at the network interface is "C" (-15 dB) and 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 to "Long h., 0 dB".
4. Set LBO C and D (not connected) to "Short h., 0 - 133 feet".

RBS 2:

The cable attenuation between RBS 1 and RBS 2 is 3 dB.

1. Calculate the total cable attenuation between RBS 2 and the network interface:
 $5 + 3 = 8$ dB
2. See the table Long haul parameters for different carrier advised codes at the network interface to find the correct LBO parameter for LBO A.
3. Set LBO A to "Long h., -7.5 dB".
4. Set LBO B to "Long h., 0 dB".
5. Set LBO C and D (not connected) to "Short h., 0 - 133 feet".

RBS 3:

The cable attenuation between RBS 2 and RBS 3 is 9 dB.

1. Calculate the total cable attenuation for RBS 3 and the network interface:
 $5 + 3 + 9 = 17$ dB
2. See the table Long haul parameters for different carrier advised codes at the network interface to find the correct LBO parameter for LBO A.
3. Set LBO A to "Long h., 0 dB".
4. 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.*

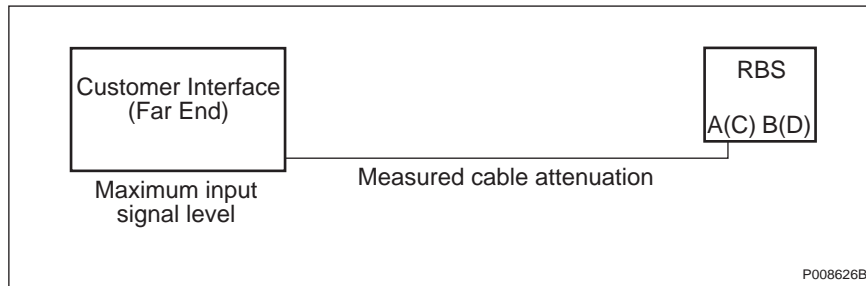
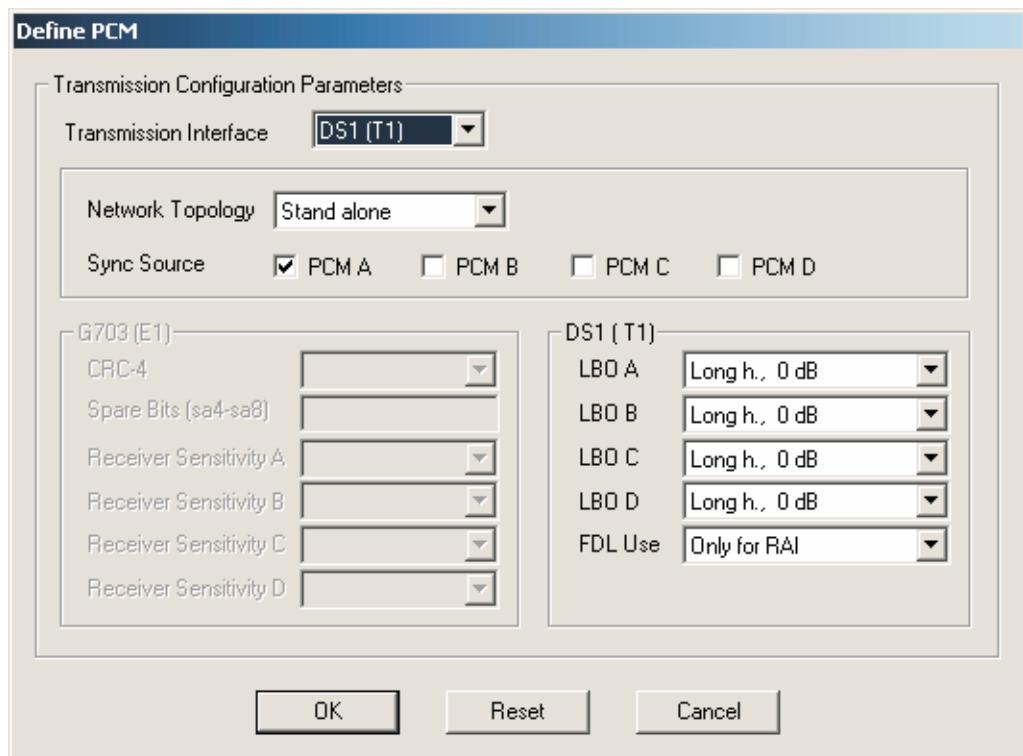


Figure 61 System Parameters for Defining LBO Parameters Automatically to Long Haul

1. On the **Configuration** menu, click **Define** and **PCM** to open the Define PCM window. See figure below.



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Figure 62 Defining Transmission Parameters

2. Use the table and instructions below to set the parameters.
3. Click **OK** when all parameters are set.

Table 40 PCM Parameter Settings for Transmission Interface T1, Long Haul Automatically

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

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

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, then 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 are for multidrop only.

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

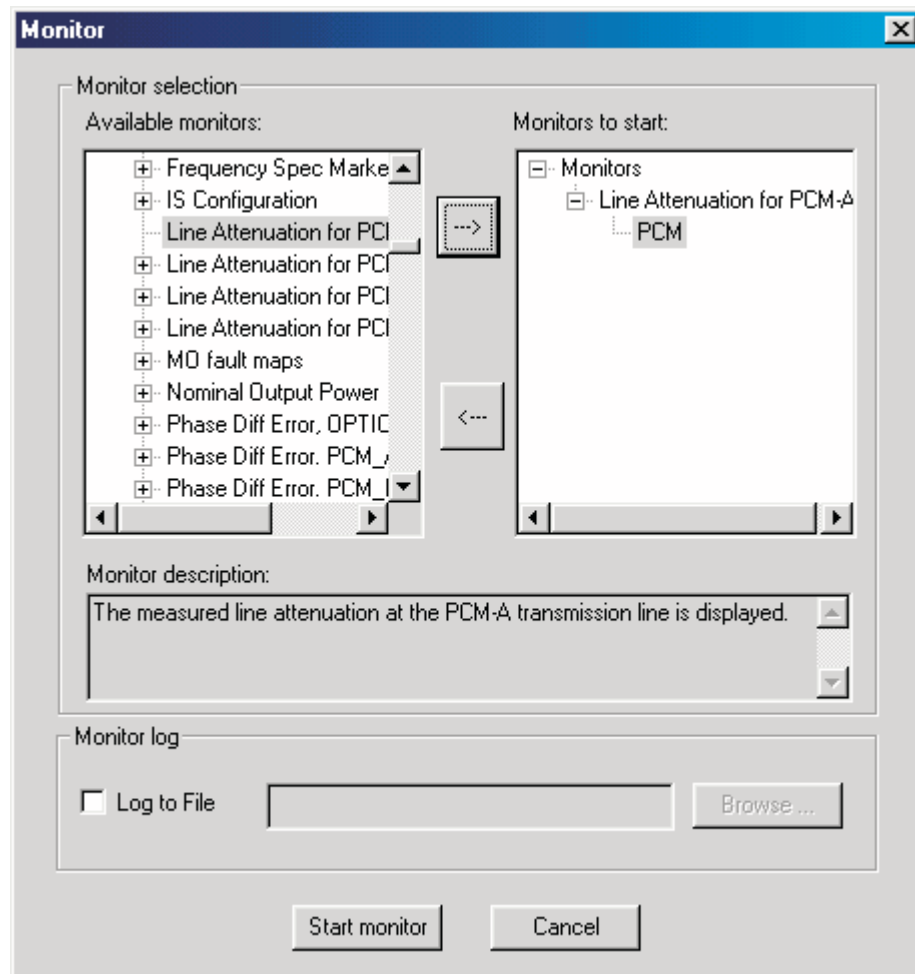
For RBS 1:

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 automatically sets 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.*



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Figure 63 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 41 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, then 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”.

If this is the last RBS in the chain, then 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, then repeat steps 7 to 14.

Example of an Automatic LBO Parameters Calculation for Long Haul

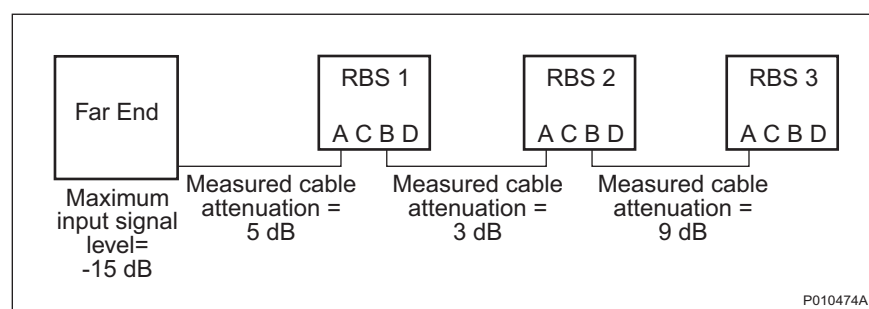


Figure 64 Calculating LBO Parameters Automatically for Long Haul

In this example, Far End, RBS 1, RBS 2 and RBS 3 refer to the figure above.

Maximum input signal level at the Far End is -15 dB. The cable attenuation is not known.

RBS 1:

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 to "Long h., 0 dB".
4. Set LBO C and D (not connected) to "Short h., 0 - 133 feet".

RBS 2:

1. Set LBO A to "Long h. ALBO, 0 dB".

The cable attenuation between RBS 1 and RBS 2 is measured to 3 dB by RBS 2.

2. Add the two measurements to obtain the total cable attenuation for RBS 2:
 $5 + 3 \text{ dB} = 8 \text{ dB}$
3. See the table above to find the correct LBO parameter for LBO A.
4. Set LBO A to "Long h., -7.5 dB".
5. Set LBO B to "Long h. 0 dB".
6. Set LBO C and D (not connected) to "Short h., 0 - 133 feet".

RBS 3:

1. Set LBO A to "Long h. ALBO, 0 dB".

The cable attenuation between RBS 2 and RBS 3 is measured to 9 dB by RBS 3.

2. Add the three measurements to obtain the total cable attenuation for RBS 3:
 $5 + 3 + 9 \text{ dB} = 17 \text{ dB}$
3. See the table above to find the correct LBO parameter for LBO A.
4. Set LBO A to "Long h., 0 dB".
5. 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 following parameters are known: carrier advised code, maximum input signal at the customer interface, cable attenuation or cable length.

1. On the **Configuration** menu, click **Define** and **PCM** to open the Define PCM window. See figure below.

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Figure 65 Defining Transmission Parameters

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

Table 42 PCM Parameter 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”

Table 42 PCM Parameter Settings for Transmission Interface T1, Transmission Characteristics Unknown

PCM Parameter	Settings
LBO B	“Long h., 0 dB”, if used “Short h., 0 – 133 feet”, if unused
LBO C	“Long h., 0 dB”, if used “Short h., 0 – 133 feet”, if unused
LBO D	“Long h., 0 dB”, if used “Short h., 0 – 133 feet”, if unused
FDL Use	<i>See Site Installation Documentation.</i>

7.6.14 Defining TEI

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

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**.

7.6.15 Defining TNOM

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

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 a valid time slot value:
 - 1 — 24 (default value 24), T1
 - 1 — 31 (default value 31), E1
4. In the TNOM Node ID box, enter the correct values. Valid TNOM Node ID values are 1 – 65534 (default value is 1). Click **OK** when finished.

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

1. Physically connect the OMT to the RBS if not already connected. See *Section 7.6.1 Connecting OMT on page 108*.
2. On the **RBS 2000** menu, click **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 7.6.2 Reading IDB on page 108*.
2. On the **Maintenance** menu, click **Monitor** to open the Monitor window. See *figure below*.