

## Required Equipment

The following describes the equipment required for testing the system at setup.

**Table 2 – Required Equipment List**

<b>Required Setup Equipment</b>	<b>Quantity</b>
<b>HP8753C Network Analyzer or equivalent</b>	<b>1</b>
<b>HP85046A S Parameter test set or equivalent</b>	<b>1</b>
<b>HP8594E Spectrum Analyzer or equivalent</b>	<b>1</b>
<b>Power supply 18/48 @ 1A</b>	<b>1</b>
<b>Signal generator HP8648B or equivalent</b>	<b>2</b>
<b>Amplifier Mini-circuit ZKL-2 or equivalent</b>	<b>1</b>
<b>Digital Multi-meter</b>	<b>1</b>
<b>RF Combiner Mini-Circuit ZAPD-21 or equivalent with N connectors</b>	<b>1</b>
<b>High-grade 50-ohm phase matched cables:</b>	
<b>N to N cables</b>	<b>4</b>
<b>N to SMA cables (in N remote type)</b>	<b>2</b>
<b>SMA to SMA cables (in SMA remote type)</b>	<b>3</b>
<b>Optical power meter (1310 nm) for minimum 3 mW</b>	<b>1</b>
<b>Singlemode duplex fiberoptic cable with SC/APC connectors</b>	<b>3m</b>
<b>Singlemode fiberoptic cable SC/APC connectors</b>	<b>3m</b>
<b>Calibration kit, including</b>	
<b>Through (N-female to N-female)</b>	
<b>Short (N-female)</b>	
<b>50 ohm (N-female)</b>	

## Test Procedures

This section explains the following test procedures:

- Pre RF Test
- Flatness Test
- Gain/IP3 Test
- Uplink Network Test

In order to carry out the tests, the following connections need to be made.

1. Connect the Base Unit optical output to the RHU optical input via fiberoptic cable.
2. Connect power to all units being tested (18V-48V DC).

Use the relevant setup for every test.

### Pre RF Test

To carry out the Pre RF Test, the following procedure needs to be carried out.

1. Make sure all DC LEDs are lit on both units.
2. Measure Tx optical output power for all lasers.  
Output power should be 1.5-2.4mW (with optical power meter).
3. On the RHU, Make sure that the optical LED is lit.
4. On the BU, make sure the Rx optical LEDs are lit.

### Flatness Test

To carry out the Flatness Test, the following procedure needs to be carried out.

1. Connect the Network Analyzer to the designated Base Unit.  
On the Network Analyzer, Base Unit connects to port 2.  
On the Network Analyzer RHU connects to port 1 (see Figure 9).
2. After calibrating the network, set Network Analyzer to:

Measure	S21
Format	Log
Scale	1db/div

3. Apply with the required F1 and F2 should be according to Product Spec.
4. Measure the difference between the highest and the lowest signal point, which should be as specified in the data sheet.

### Gain/IP3 Test

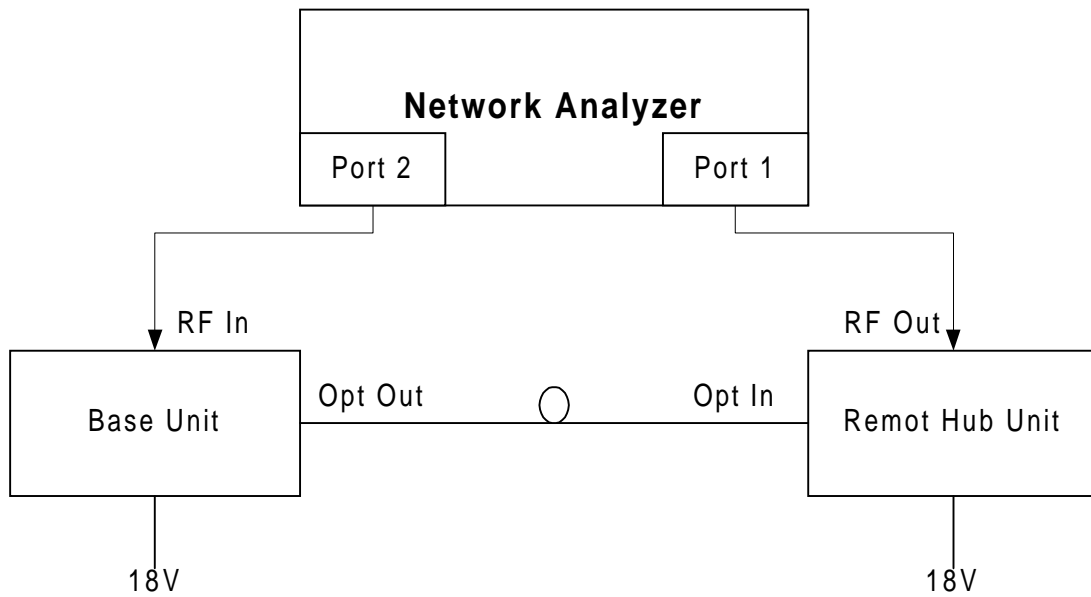
To carry out the Gain/IP3 Test, the following procedure needs to be carried out.

1. Set the 2 tone signal from the 2 signal generators.  
RF signals F1 and F2 should be according to Product Spec.
2. Combine the signals with ZAPD-21 combiner or equivalent.
3. Connect the 2-tone signal to the input of the base (see Figure 10).
4. Set Spectrum Analyzer to:

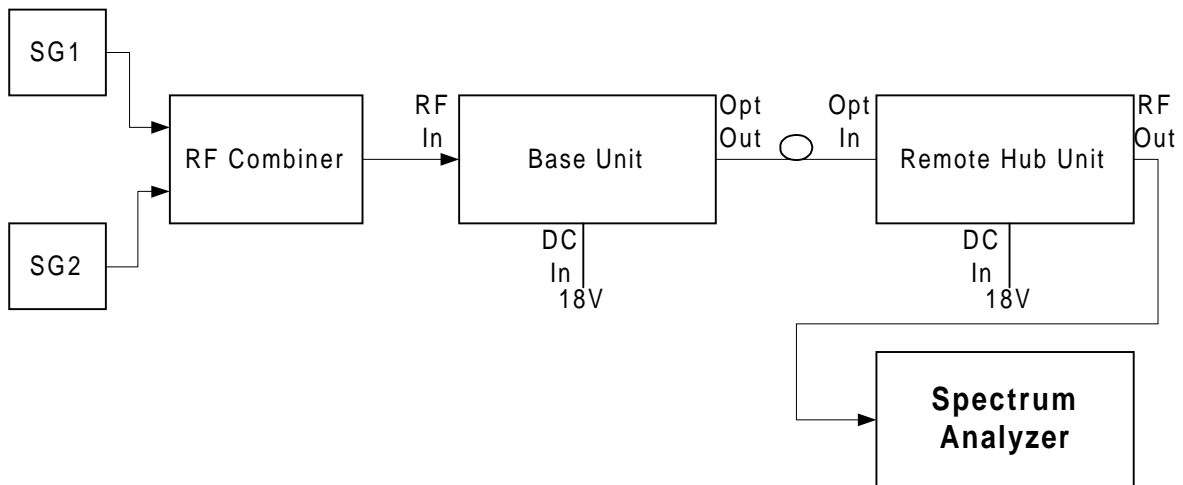
Video BW	10khz
RBW	100khz
Attenuation	20db
Span	30Mhz
Center freq.	Refer to Product Spec.
Ref level	10dbm

5. Connect RF cable from the RHU output to the Spectrum Analyzer.
6. Measure output Gain/IP3 from all test RHUs DownLink outputs.
7. IP3 is determine by:  

$$IP3 = \text{power tone} + (\text{power tone} - \text{powerM3})/2.$$



**Figure 9 – Network Analyzer Setup Test**



**Figure 10 – Spectrum Analyzer Setup Test**

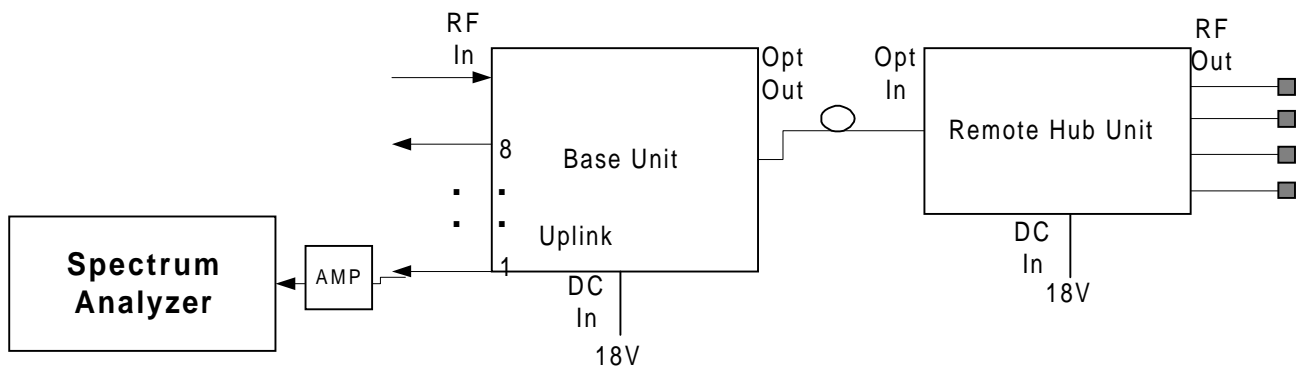
## Uplink Network Test

To carry out the Noise Floor test, the following procedure needs to be carried out.

1. Connect the Spectrum Analyzer to the Base Unit uplink port.  
Connect 50ohm terminators to the RHU ports, and to all Base Unit uplink ports except for the tested port (see Figure 11).
2. Extra amplification (25db) is applied between Base Unit and Spectrum Analyzer in order to measure the noise floor.
3. Set Spectrum Analyzer to:

Video BW	300hz
RBW	1khz
Attenuation	0db
Span	0hz
Center freq.	Refer to Product Spec.
Ref level	-50dbm
Marker noise	ON

4. The noise figure is formulated as:  $-174 + G_{\text{system}} + \text{noise floor}$   
(On the RHU, all unused ports must be terminated with 50ohm load.)



**Figure 11 – Uplink Network Test**