Set RX Sensitivity without a DACU

Tools and equipment needed.

Item	Description	Recommended Model	Quantity
1	Digital Multimeter	Fluke 77	1
2	ST Test Unit,	SIU with Modified Antenna at appropriate band	1
3	30dB Attenuators; 5W	Mini Circuits: BN-N30W5	2
4	30dB Attenuators; 2W	M/A-COM:2082 6044 30:2W	2
5	Two Way Power Divider	Mini Circuits: ZAPD-4-S	1
6	50 ohm Termination 10W	Arra N9510	1
7	Adaptor; N-SMA	Huber & Suhner 33N-SMA-50-1	1
8	Adaptor; N-SMA	Huber & Suhner 31N-SMA-50-1	1
9	Co-ax Cables	Huber & Suhner Sucoflex 104; 0.5m	2
10		Huber & Suhner Sucoflex 104; 4.0m	1
11	Cable SMA-MCX	Huber & Suhner 30-05918-10	1
12	RF Power Meter	Marconi 6970	1
13	Power Sensor	Marconi/RFI 6970&5 6932/900	1

RX Sensitivity (Test 6)

The RX sensitivity is set according to the required CT RX level. It is important to note that the lower the modulation rate the further the geographical spread. For maximum range the AS4020 should use QPSK 1/2. Higher data rates may be achieved using higher orders of modulation but the range will lessen as the modulation rate increase. This level is determined as part of the planning function and takes into consideration the highest modulation rate to be offered and the noise floor predicted in the planning stage.

The RX Level is set dependant on the highest operational modulation rate as follows. By undertaking an appropriate level of RF planning the level is optimised in order to balance uplink data rate and system range.

Typical levels are shown below for two network configuration scenarios:
For networks where only a single RF Channel is operating, or only adjacent + one RF Channels are used (no co or adjacent channel interference), the following CT Rx levels apply:

| Modulation Code	Rate	Rx Level (dBm / RW)		Session ids for LAT TE command in Mode 3
		Below 3GHz	**Above 3GHz**	
QPSK	1/2	-105 dBm	-103dBm	58 or 59
QPSK	3/4	-103 dBm	-101dBm	56 or 57
16QAM	1/2	-97 dBm	-95dBm	54 or 55
16QAM	3/4	-93 dBm (see note 1)	-91dBm	52 or 53
64QAM	3/4	Not supported on the uplink		

Table 1

Note 1: Note, 16QAM ¾ is only supported on the uplink with up to 7RW Codes Active.

For networks where co or adjacent frequencies are reused to provide cellular type network coverage with limited available spectrum (ie. A relatively high level of co and adjacent channel interference), the following CT Rx levels apply:

Modulation Code	Rate	Rx Level (dBm / RW)		Session ids for LAT TE command in Mode 3
		Below 3GHz	Above 3GHz	
QPSK	1/2	-103 dBm	-100dBm	58 or 59
QPSK	3/4	-101 dBm	-98dBm	56 or 57
16QAM	1/2	-94 dBm	-92dBm	54 or 55
16QAM	3/4	-90 dBm (see note 1)	-88dBm	52 or 53
64QAM	3/4	Not supported on the uplink		

Table 1a

1. To set the receive sensitivity, first set up a test network for the band under test as shown below. The figure below shows a typical test setup with test equipment connected directly to the outputs of the DIP/LNA and DIP/LNA2 as would be the case for systems without a RF coupler.
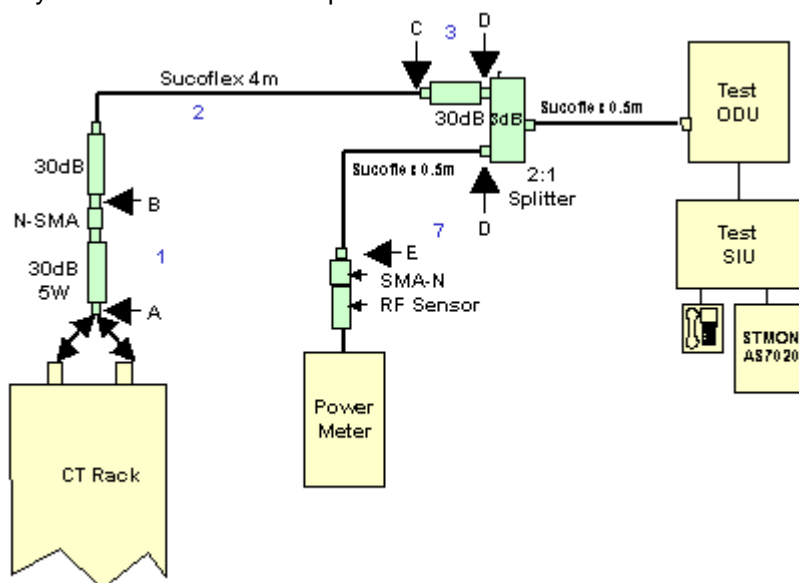
Test Set-up

2. Zero power meter. Calibrate and apply measurement offset for operational frequency if applicable.
3. On the AS4020 go to Top Menu >Setup Menu >RF Menu>RX Sensitivity. Set RX to 2500
4. Put AS4020 Shelf into test mode **Off** and then into test mode 3. (from AS4020 menu select Setup Menu/RF Menu/RF Commissioning)
5. Configure the Test SIU using AS7020STMON according to modem shelf properties to the correct frequency, PN code and ID number prior to entering test mode. The commissioning procedure described in this document is not restricted to any particular RF channel or PN code. However the user should make sure that both the CT and ST are programmed with identical RF channel and PN code. If the frequency can be entered using STMON then the FP command in the step 12 is not necessary)
6. Measure and calibrate the loss of all components shown in the diagram above. To measure the losses of components use the TX output as a reference source. Measure the TX output and place figure in table below.. Connect each component in

turn between the TX output and the power meter and measure the loss added as the component is inserted. Measure (1)A-B, (2)B-C, (3)C-D and (7)D-E.

7. Calculate and enter values in calibration chart for the relevant frequency.

RF Channel No:		
Ref TX output		
RF Section	A-B Atten.**(1)**	
	B-C Atten.**(2)**	
	C-D Atten.**(3)**	
	Sub Total **(4) 1+2+3**	
	Required CT RX Level **(5)** see table 1	
	ST TX Power **(6)**=4+5	
RF Section	D-E Atten **(7)**	
	Power Meter **(8)** = 6-7	

8. Calculate/determine overall path loss and required ST output power and hence required power meter reading.
9. Connect cables as per diagram above. Try to ensure that the network is set to reduce the amount of radiated pick up. To ensure that it is the receive path that is being measured and not pickup place an attenuator (6dB) into the network and check that the meter falls by a corresponding amount. If it fails to do so additional screening of the test network is probably required.
10. Connect a terminal emulator to the ST.
11. Make the test ST transmit by sending the following LAT commands from a terminal emulator connected to the ST
    TE<space> 0<space> 4<space> 59 (this code sets the uplink modulation rate for the ST see table 1)
    FP <space>channel number (in decimal)
    W<space> 0400003C

12. The terminal emulator should receive 0000000B for the uplink if the ST has acquired a link.
13. On the AS4020 go to Top Menu >Setup Menu >RF Menu>RX Sensitivity
14. Set RX gain by increasing/decreasing the value of RX sensitivity to achieve required ST o/p level as calculated in step 8 for the required RX Level.
15. Record ST o/p level and value set.

Link Check

9. When the link has successfully acquired enable the equalizer by typing the following LAT commands
    ADE 1 10 (this enables the downlink channel equalizer and it should converge within 10 seconds)
    ADS (this command displays the equalizer stats).
    When the equalizer is adapting the stat reports Enabled = 1 Converged = 0
    When the equalizer is adapting the stat reports Enabled = 0 Converged = 1(release 7.2x) or Enabled = 1 Converged = 1(release 7.3x)
    Check that the equalizer converges OK.
10. From the ST LAT type TE1 to exit commissioning mode

11. From the AS4020 front panel exit commissioning mode by selecting RF Commissioning = Off.