Redefining Wireless Technology

INSTALLATION
AND
OPERATING MANUAL

FOR

BDA-ESMR-2/2W-80-AN89R

DUAL BAND BI-DIRECTIONAL AMPLIFIER

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BDA OVERVIEW:

The BDA assembly extends the coverage area of radio communications in buildings and RF shielded environments.

The unit features low noise figure and wide dynamic range. It is a multi-block system, based on a dual-duplexed (quadruplexer) path configuration with sharp out of band attenuation allowing improved isolation between the receiving and transmitting paths, plus ESMR 800 and SMR 900 paths.

The BDA has an integrated re-banding switch to change the frequency of operation in the ESMR 800 band.

BDA BLOCK DIAGRAM DESCRIPTION:

Refer to figure 1 for the following discussion.

The BDA Downlink path receives RF signals from the base station and amplifies and transmits them to the subscriber. The BDA Uplink path receives RF signals from the subscriber and amplifies and transmits them to the base station.

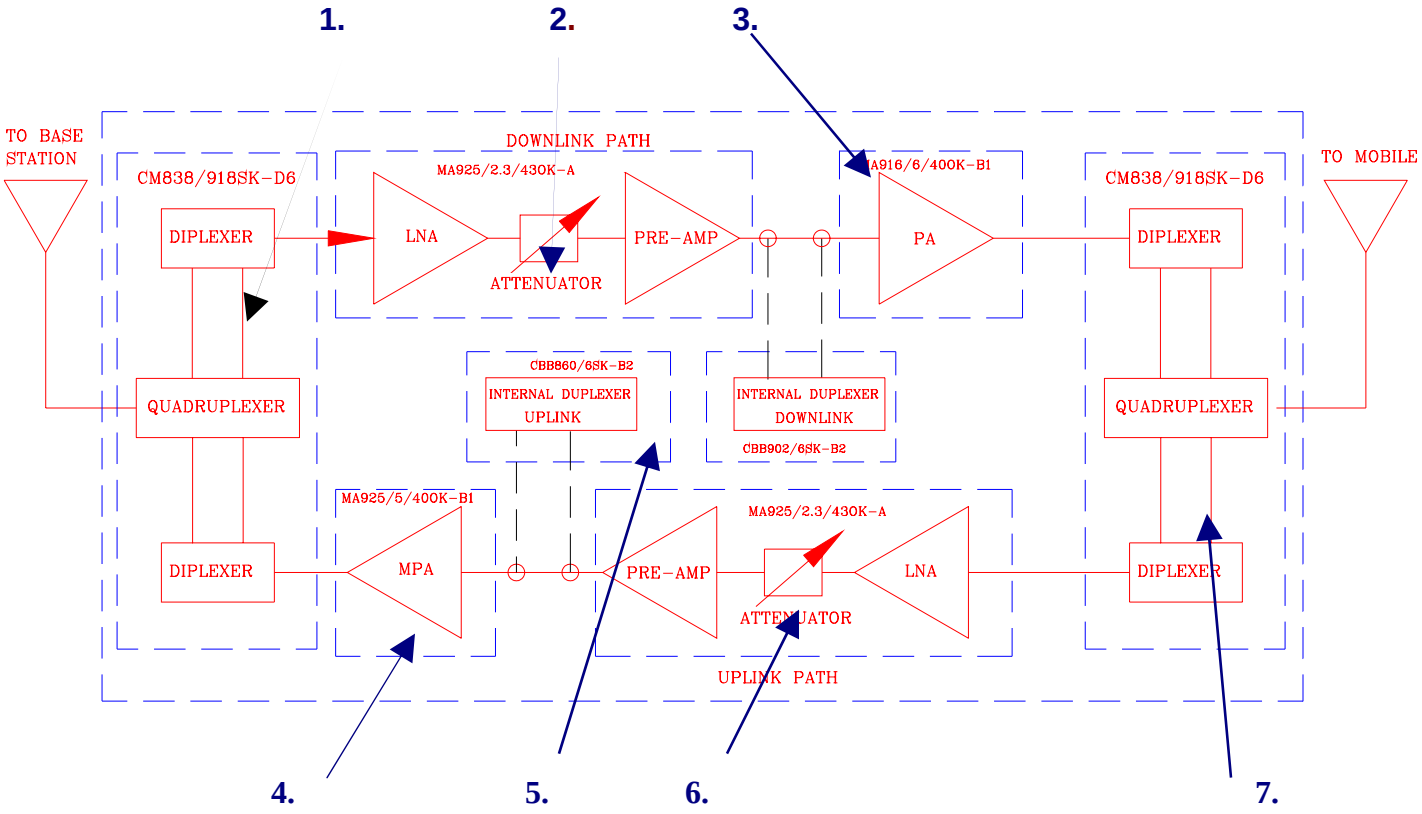
For SMR distinct frequency bands; ESMR 800 frequency bands are as follows: (806-824 MHz) for the Uplink and (851-869 MHz) for the Downlink. SMR 900 frequency bands are as follows: (896-901 MHz) for the Uplink and (935-940 MHz) for the Downlink. A quadruplexer isolates the Uplink and Downlink paths in the SMR chain, plus a switched* internal duplexer will change the ESMR 800 frequency band to its re-banding frequency range.

A selectable Automatic Level Control (ALC) allows for output power limiting. A variable step attenuator gives 0 – 30 dB of attenuation in 2 dB steps. The use of these controls is covered in the “OPERATION” section, later in this document.

*Re-banding Switch

The re-banding switch changes the frequency of operation in the ESMR 800 band to Uplink (817-824 MHz) and Downlink (862-869 MHz). There is no tuning require, just select the narrow SMR position for re-banding frequencies. (See Figure 5)

Figure 1



BDA BLOCK DIAGRAM
BDA-ESMR-2/2W-80-AN89R

1. Uplink SMR Quadruplexer - has low bandpass insertion loss and high selectivity.
2. Downlink Pre-amp - is a low noise amplifier that drives the Downlink MPA and offers 45dB Gain.
3. Downlink MPA – is a high power amplifier with an ALC circuit which offers 43dB Gain.
4. Uplink MPA – is a medium power amplifier with an ALC circuit which offers 43dB Gain.
5. Re-Banding Duplexer - is used for when re-banding of the ESMR800 frequency band occurs, by selecting its switch position.
6. Uplink Pre-amp - is a low noise amplifier that drives the Uplink MPA and offers 45dB Gain.
7. Downlink SMR Quadruplexer - has low bandpass insertion loss and high selectivity.

ELECTRICAL SPECIFICATIONS:

Frequency Range

SMR 800/900

Downlink	: 851-869 (862-869 re-band) and 935-940 MHz
Uplink	: 806-824 (817-824 re-band) and 896-901 MHz
Pass band Gain @ min attenuation	: 80 dB min.
Variable Step Attenuator Range (2-dB steps)	: 0-30 dB
Pass band Ripple	: ±1.5 dB typical
Noise Figure @+25°C at max gain	: 4.0 typical (4.5 dB max.)
3rd Order Intercept point	: +46 dBm typical
Output Power @ 1dB Compression	: +34 dBm typical
Isolation between Up/Down Link	: 80 dB min.
Input/ Output Impedance	: 50 Ohms
VSWR (Input/Output)	: 1.5: 1 max
Power Supply	: 110VAC/0.9 Amp : 240VAC/0.45 Amp : 50 to 60 Hz

*The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

MECHANICAL SPECIFICATIONS:

Size	: 18.1 x 16.0 x 9.1 inch : (460 x 406 x 231 mm) approx.
RF Connectors	: N-type Female
Weight	: 48 Lbs. (21.7 kg.) approx.

ENVIRONMENTAL CONDITIONS:

The unit is designed for indoor applications:

Operating temperature: - 20°C to + 50°C

Storage temperature: - 50°C to + 90°C

BDA CONNECTIONS

The BDA AC power is accepted through a standard 3-wire male plug (IEC-320) with phase, neutral and ground leads. The AC power is wired to a high efficiency DC switching power supply which is CE and UL approved. The power supply runs the amplifiers and the Power On lamp. The metal enclosure of the BDA is connected to ground. An optional 9-pin D-Sub connector provides failure alarm output contacts (see diagram next page) as well as an optional 12 VDC (250mA) auxiliary output.

The RF connections are made via two type “N” female connectors. The RF connector labeled “BASE” must be connected to the antenna pointing towards the base station. The RF connection labeled “MOBILE” must be connected to the antenna facing the area to be covered by the BDA. The RF connections must be made through cables with characteristic impedance of 50 ohms.

The isolation between the base station antenna and the mobile antenna should be at least 12 dB higher than the BDA gain. Isolation less than this value can cause gain ripple across the band. Isolation equal to or less than the BDA gain will give rise to oscillations which will saturate the amplifiers and possibly cause damage to the BDA.

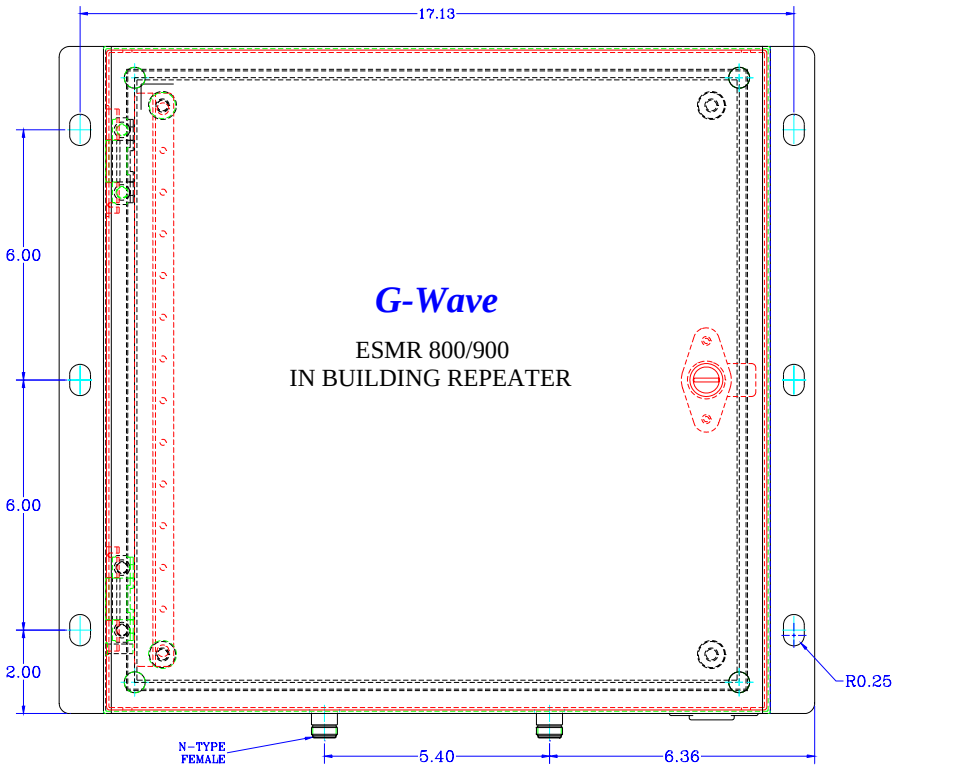
RF EXPOSURE WARNING

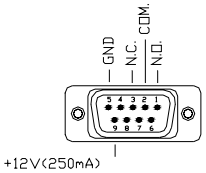
In order to satisfy the FCC RF exposure requirements, the BDA/antenna installation must comply with the following:

The outdoor antenna (Yagi type or similar directional antenna) must be installed so as to provide a minimum separation distance of 0.3 meters (30 cm) between the antenna and persons within the area. (This assumes a typical antenna with gain of [10.1 dBi, VSWR ≤ 1.5:1, Zo= 50 ohms, and a cable attenuation of between 1-10 dB).

The indoor antenna (omni directional) must be installed so as to provide a minimum separation distance of 0.2 meters (20 cm) between the antenna and persons within the area. (This assumes a typical wide-beam type antenna with gain of 0-2 dBi, VSWR ≤ 2:1, Zo= 50 ohms, and a cable attenuation of between 1-10 dB).

Figure 2





Alarm/Optional
Power Supply Pinout
(Relay States Refer To
NON Alarm Condition)

BDA Mechanical Outline

BDA INSTALLATION

DO NOT APPLY A.C. POWER TO THE BDA UNTIL CABLES ARE CONNECTED TO BOTH PORTS OF THE BDA AND THE ANTENNAS.

1. Mount the BDA on the wall with the RF connectors pointing DOWN. Using appropriate screws and anchors, attach the BDA to the wall at the four mounting holes on the side flanges.

2. Ensure that the isolation between the donor antenna and the service antenna is at least 12 dB greater than the BDA gain. **(Use the higher of the Uplink and Downlink gains reported on the BDA test data sheet).**

3. Connect the cable from the donor antenna to the BDA connector labeled “BASE” and the cable from the service antennas to the BDA connector labeled “MOBILE”.

4. Open the access door on the BDA. Verify that both of the attenuators are positioned to their maximum setting (30 dB). Close the panel.

5. Connect the AC power cord to the BDA and then to the power source. Verify that the “Power ON” lamp is illuminated.

Installation of the BDA is now complete. To adjust the gain controls to suit the specific signal environment, refer to the next section of the manual.

Note: For repeat installations of existing equipment, make sure the attenuation is positioned to its maximum setting (30 dB). After verification of attenuation, follow the above steps starting with step 1.

BDA OPERATION

Refer to figure 4 & 5 for adjustment access location and label.

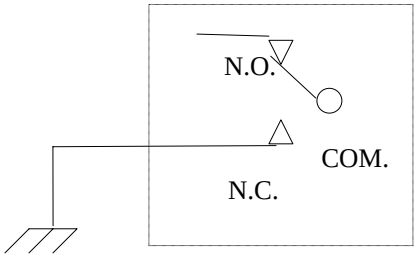
Variable Step Attenuator

BDA gain can be reduced by up to 30 dB in 2 dB steps using the variable step attenuator (Figure 5). Gain adjustment is made with rotary switches accessible via the access door on the BDA enclosure. Arrows on the shafts of these switches point to the value of attenuation selected. BDA gain can be determined by subtracting the attenuation value from the gain reported on the BDA Test Data Sheet for that side of the unit. The attenuators are labeled for Uplink and Downlink.

Alarm Function

The alarm monitors current of both uplink and downlink amplifiers in each path. An alarm condition will occur in each path if either the uplink or downlink amplifiers are over or under its current tolerance or there is no supply power present.

(*Relay Shown in Non-Alarm Condition*)



Re-banding Switch

The re-banding switch changes the frequency of operation in the ESMR 800 band from uplink (806-824 MHz) and downlink (851-869 MHz) to uplink (817-824 MHz) and downlink (862-869 MHz). There is no tuning require, just select the narrow SMR position when re-banding occurs. (See Figure 5)

ALC (Automatic Level Control)

To minimize intermodulation products, each amplifier in the BDA contains an ALC feedback loop. The ALC circuit senses the output power and limits both Uplink and Downlink to the factory preset level of +26 dBm. A red indicator lamp located on the control panel illuminates when output power exceeds the ALC set point.

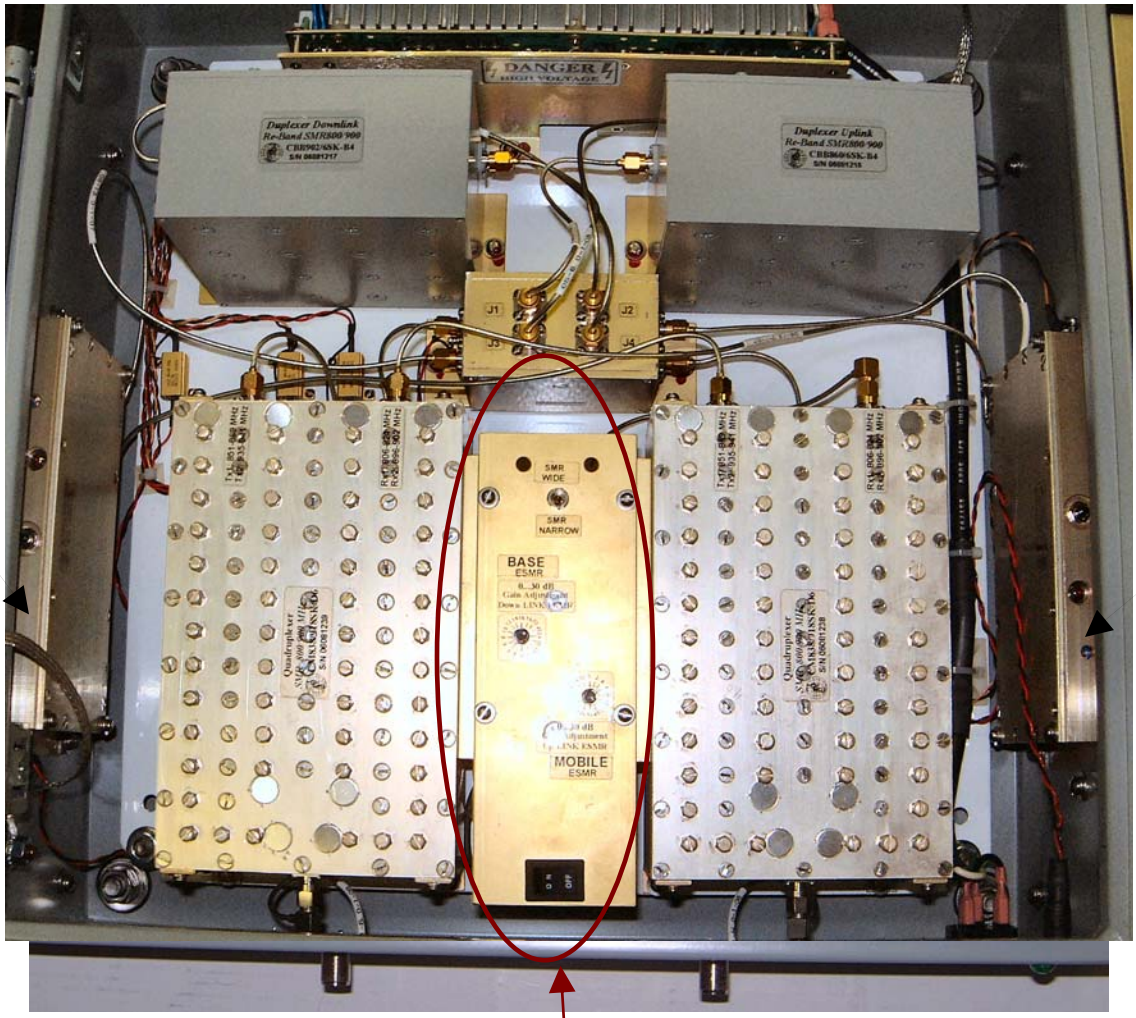
To establish proper operating gain on the Uplink and Downlink sides, start with the Downlink. Observe the red indicator lamp on the Downlink amplifiers. Units are shipping with maximum attenuation. Decrease attenuation one step at a time until the lamp is lit. Then, using the each Downlink step attenuator, increase the attenuation until the lamp goes off. Repeat the process for the Uplink. The level indicator is accurate to +/- 0.4 dB of the ALC set point.

Operation of BDA-ESMR-2/2W-80-AN89R at minimum attenuation with greater than -40 dBm average power incident on either BASE or MOBILE port can cause damage to the BDA.

Figure 4

Inside Layout

SMR 900 Uplink MPA
ALC circuit inside

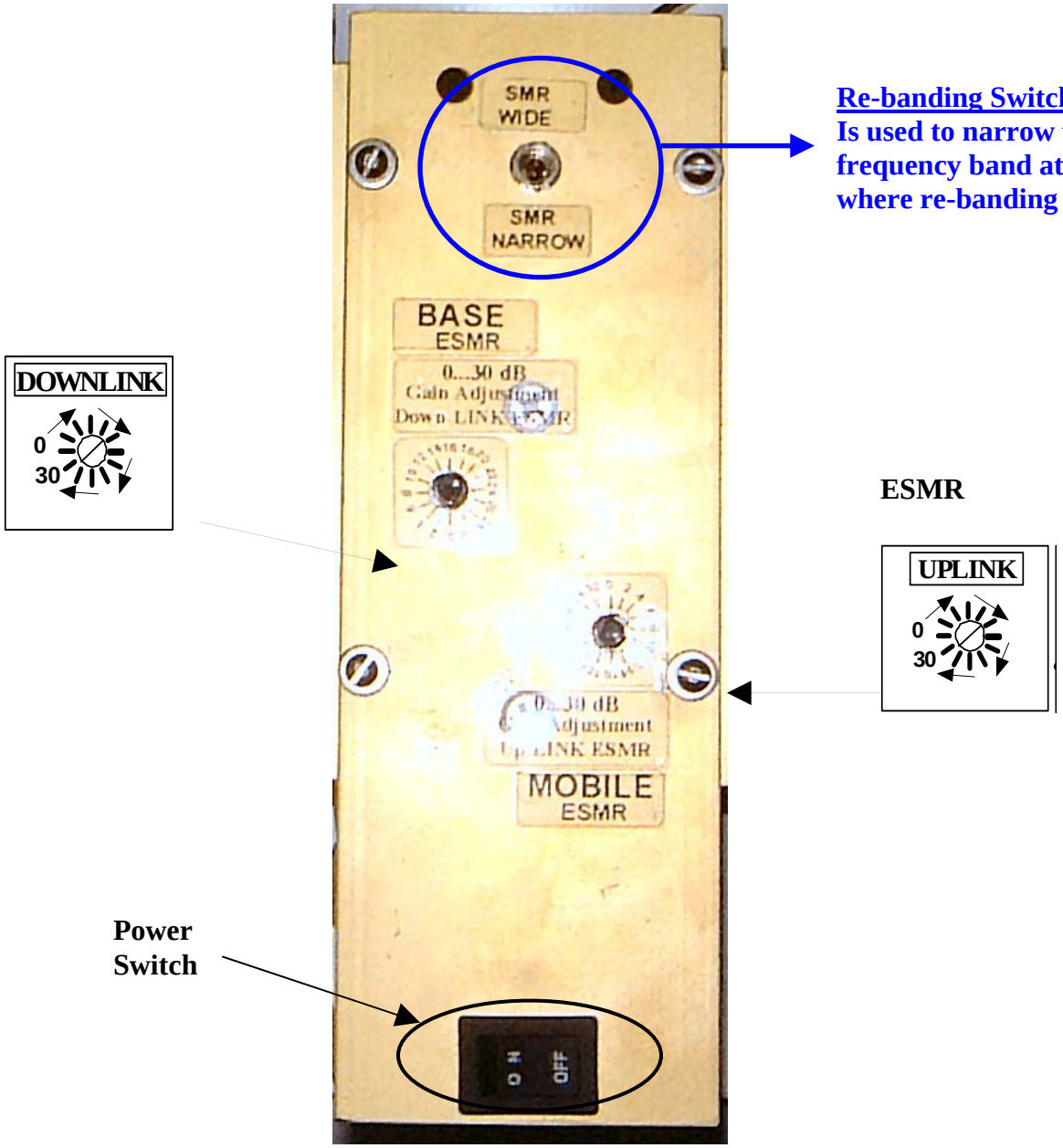


SMR 800 Uplink MPA
ALC circuit inside

Control Panel (See Figure 5)

Figure 5

Control Panel



Re-banding Switch:
Is used to narrow the SMR 800 frequency band at the sites where re-banding occurs.

ESMR

UPLINK

Power Switch

DIAGNOSTICS GUIDE

The BDA provides long term, carefree operation and requires no periodic maintenance. There are no user-serviceable components inside the BDA.

This section covers possible problems that may be related to the installation or operating environment.

a. Gain Reduction

Possible causes: Bad RF cables and RF connections to antennas, damaged antennae.

b. Excessive Intermodulation or Spurious

Possible causes:
Amplifier oscillation caused by insufficient isolation. The isolation between two antennae is given by the equation:
Isolation = 92.5 + 20 Log (F x D) – Gt – Gr
Where:
F = frequency (GHz)
D = separation (Km)
Gt = transmit antenna gain (in the direction of the receive antenna).
Gr = receive antenna gain (in the direction of the transmit antenna).

For example, at the SMR frequencies, the antenna isolation at 100 m separation is about 71 dB for omni-directional antennas (0 dB gain). To increase isolation, the antennas should have higher directivity and must be pointed away from each other.

c. Occasional Drop-out of some Channels

Possible causes: One channel with very strong power dominates the RF output of the amplifier.

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