

CHANNEL EXTENSION MODULES

UR-FR5300

UR-FR6300

INSTALLATION NOTES

• Compliance of base station transmitter installations with EN50385

The installation of this equipment and its associated antenna should be made in such a manner as to respect the EC recommended electromagnetic (EM) field exposure limits. (1999/519/EC)

In order not to exceed these exposure limits it is necessary to determine the 'Compliance Boundary,' that means the volume within which the EM field radiated by the transmitter/antenna installation may exceed the 1999/519/EC limits. You will then need to ensure that members of the general public do not have access within this area. The actual Compliance Boundary for this repeater will be totally dependant on the antenna, feeder, RF amplifier and other passive or active devices used in the installation.

The RF output power of this repeater is 25 watts.

The figures contained in this guide are based on the recommended limits for the general public and are obtained by 'worst case' numerical analysis. For a definitive evaluation of any given installation, measurements should be made with an EM field meter and a broadband calibrated probe.

• Installation

The antenna should be installed as high as possible for maximum efficiency and minimum EM field at ground-level. The evaluation of radiated field should take into account any additional RF amplifiers used, any loss in the antenna feeder cable and the gain of the antenna used as well as its polar radiation pattern.

If there are any objects or structures larger than half a wavelength close to the antenna, or within the clearance distances specified, then these can cause reflections which will have an effect on the overall radiation pattern.

For any installation you need to consider 'height clearance' (i.e. the height above any place where persons may have access) and 'front clearance' (i.e. the distance in front of the antenna where the radiated field may exceed the recommended limits). Normally with an antenna installed on a reasonably high mast or tower, there will not be any access point directly in front but care should be exercised when there are other buildings higher than the antenna within the vicinity.

• Installation with a vertical type antenna at VHF-UHF

You need to consider the distances between the antenna and any point where persons may have access. Allowing an average height of 1.8 m for a person in the vicinity of the antenna the clearance distances can be evaluated as follows. For the antenna a forward gain of 1.6 and downward gain of unity has been assumed.

Power	EIRP	Distance	Height clearance	Front clearance
1 watt	1.6 watts	0.32 m	2.1 cm	0.4 m
10 watts	16 watts	1 m	2.8 m	1.3 m
25 watts	40 watts	1.6 m	3.4 m	2 m
100 watts	160 watts	3.2 m	5 m	4 m
1 kW	1600 watts	10 m	12 m	13 m

• Installation with a yagi or directive type antenna

Exposure distance assumes that the predominant radiation pattern is forwards and that radiation vertically downwards is at unity gain (sidelobe suppression is equal to main lobe gain). This is true of almost every gain antenna today. Exposed persons are assumed to be beneath the antenna array and have a typical height of 1.8 m.

The figures assume the worst case emission of constant carrier.

RF power	Clearance heights by frequency band			
Watts	10–2 m	70 cm	23 cm	13 cm and above
1	2.1 m	2 m	2 m	2 m
10	2.8 m	2.7 m	2.5 m	2.3 m
25	3.4 m	3.3 m	2.7 m	2.5 m
100	5 m	4.7 m	3.6 m	3.2 m
1000	12 m	11.5 m	7.3 m	6.3 m

EIRP	Forward clearance, EIRP by frequency band			
Watts	10–2 m	70 cm	23 cm	13 cm and above
100	2 m	2 m	1.1 m	0.7 m
1,000	6.5 m	6 m	3.5 m	3 m
10,000	20 m	18 m	11 m	7 m
100,000	65 m	60 m	35 m	29 m

• Typical installation example

A UHF base station transmitter is to be installed on the roof of an office.

The transmit power is 25 watts, there is 20 m of RG-213 coaxial cable and the antenna is vertically polarised dipole.

The specification of the RG-213 cable gives a loss of 1.5 dB/10 m. There will be 3 dB loss for the 20 m length used.

The RF power at the antenna input will be 12.5 watts.

The dipole antenna has a forward gain of 0 dBd or 1.6, giving an EIRP of 20 watts.

Referring to the table above for VHF/UHF vertical antennas, this gives a front clearance distance of approx. 1.5 m and a height clearance of 3 m.

The antenna installation needs to ensure that the lowest part of the antenna is at least 3 m above any point where the general public may gain access and that they cannot pass within 1.5 m in front of the antenna.

If there is no general public access to the roof in question then the antenna could be mounted on a short stub mast. If there is such access to the roof then the antenna could be mounted on top of a short mast of 3.2 m high. The mast position should be such that the antenna can radiate clearly i.e. no other object or structure is within 1.5 m (preferably more).

It should be relatively easy to fulfil all these recommendations.

If for any reason such minimum distances are impossible to guarantee then some type of access control fence or barrier around the antenna installation should be provided.

Should a Yagi type antenna be used then you will have to obtain a 3 dimensional polar plot of the radiation characteristic from the manufacturer and evaluate the clearance distances in both vertical and horizontal planes.

• Operating Notes

All of the above comments on RF safety assume that the radio is transmitting continuously in a constant carrier mode such as FM or RTTY etc.

The RF exposure limits recommended by the EC are based on the mean power averaged over a 6 minute period.

Therefore if the total transmit time during any 6 minute period is reduced, then the installation will be even further within the recommended limits.