PageCenter Radiation Field RF Exposure Calculations:

Declare Constants and Formulas:

$m \equiv 1$ $cm \equiv .01 \cdot m$ $mm \equiv .001 \cdot m$

$s \equiv 1$ $\Omega \equiv 1$ $dB \equiv 1$ $V \equiv 1$ $mV \equiv .001 \cdot V$

$Hz \equiv \frac{1}{s}$ $KHz \equiv 1000 \cdot Hz$ $MHz \equiv 1000 \cdot KHz$

$W \equiv 1$ $mW \equiv .001 \cdot W$ $uW \equiv .001 \cdot mW$

$c := 300 \cdot 10^6 \cdot \frac{m}{s}$ Speed of Light

$Zo := 120 \cdot \pi$ Free Space Impedance

$Zo = 376.991\,\Omega$

$pwr(db) := 10^{(.1 \cdot db)}$ Conversion from dB to linear power

$dBuV(x) := 20 \cdot \log\left(x \cdot 10^6\right)$ Conversion to dBuV

Calculate Wavelengths:

$Fc := 460 \cdot MHz$ Center Frequency

$\lambda c := \frac{c}{Fc}$

$\lambda c = 0.652\,m$ Center Frequency Wavelength

Calculate Near / Far Field Transition Ranges:

$L := 12 \cdot cm$ Antenna Length

$Tc := \frac{2 \cdot L^2}{\lambda c}$ Center Frequency Transition Range

$Tc = 4.416\,cm$

Calculate Far Fields:

$Ptx := 5 \cdot W$ Peak Transmitter Power

$Gant := 0 \cdot dB$ Antenna Gain

$Ggnd := 0 \cdot dB$ Effective Antenna Gain due to ground reflections

$range := 1 .. 30$ Calculate Fields at Ranges from .1 to 3 meters

$D := 100 \cdot \%$ Transmitter Duty Cycle

$S_{range} := \frac{Ptx \cdot D \cdot pwr(Gant) \cdot pwr(Ggnd)}{4 \cdot \pi \cdot (.1 \cdot range)^2}$ Calculate the Average Power Density

$Spec := \frac{Fc}{1500} \cdot \frac{mW}{cm^2}$ FCC Average Power Spec Limit for Uncontrolled Exposure

Measurement Range (meters) $\frac{.1 \cdot range}{m} =$	Average Power Density $\frac{S_{range}}{\left(\frac{W}{m^2}\right)} =$	$\frac{S_{range}}{\left(\frac{mW}{cm^2}\right)} =$
0.1	39.789	3.979
0.2	9.947	0.995
0.3	4.421	0.442
0.4	2.487	0.249
0.5	1.592	0.159
0.6	1.105	0.111
0.7	0.812	0.081
0.8	0.622	0.062
0.9	0.491	0.049
1	0.398	0.04
1.1	0.329	0.033
1.2	0.276	0.028
1.3	0.235	0.024
1.4	0.203	0.02
1.5	0.177	0.018
1.6	0.155	0.016

FCC's Specification Limit

$Spec = 306667 \frac{mW}{cm^2}$

SECTION 1

GENERAL INFORMATION

1.1 SCOPE OF MANUAL

This service manual contains alignment and service information for Dataradio COR Ltd.'s DM-3412 UHF Synthesized Telemetry Module.

This manual concentrates on the RF section of the data link which may be paired with a 9600 baud Modem (T-96SR).

1.2 EQUIPMENT DESCRIPTION

1.2.1 GENERAL

The Dataradio DM-3412 is a synthesized data transceiver (transmitter and receiver) which operates in the 380-512 MHz UHF frequency range. Transmitter power output is 5 watts nominal at 13.3V DC in simplex or half duplex modes.

Versions of the DM-3412 covered in this manual are indicated in Section 1.5. The DM-3412 has a frequency stability of ± 1.5 PPM (see Section 3).

The number of channels that can be selected with the DM-3412 model is determined by customer supplied synthesizer loading circuitry.

1.2.2 DM-3412 SYNTHESIZER PROGRAMMING

The DM-3412 requires customer supplied circuitry to load the synthesizer with channel information. The protocol that this circuitry must follow is described in Section 3.

1.3 TRANSCEIVER IDENTIFICATION

The transceiver identification number is printed on a label that is affixed to the PC board. The following information is contained in that number:

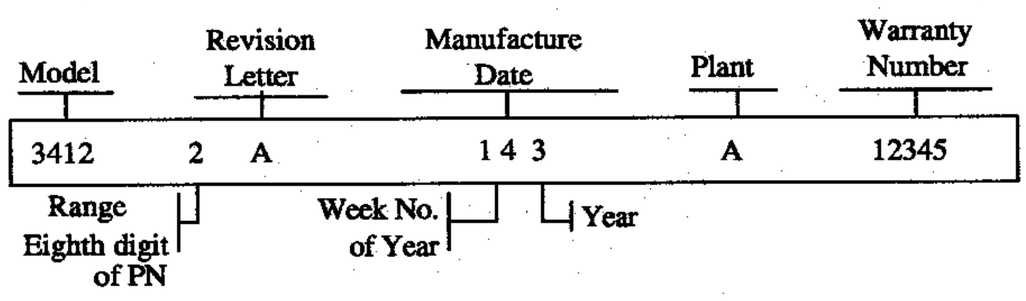

FIGURE 1-1 TRANSCEIVER IDENTIFICATION NOMENCLATURE