WV Communications RFC Major Specifications

1. IF RECEIVE PATH

1.1. RF Input

1.1.1. Frequency (Band Frequencies Step Size and Modulation Type)

Band	Frequency Range name	Frequency [MHz]		Step Size [KHz]	Modulation Type	Modulation BW
		Min	Max			
BAND1	LVHF	30	88	8.33, 12.5, 25	AM, FM	±1MHz ±250KHz ±50KHz ±10KHz
BAND2	VHF	108	156	8.33, 12.5, 25	AM,QPSK	
	VHF	156	174	8.33, 12.5, 25	FM,QPSK	
BAND3	UHF	225	400	8.33, 12.5, 25	AM, FM,QPSK	

Input signal from the antenna connector at 0.1-watt level for 3 minute shall not cause residual damage to the RFC.

1.2. Reference Signal Input

1.2.1. Internal Clock

1.2.2. Nominal Frequency 20MHz ± 3.5ppm

(Including Aging first year, Reflow Voltage and Load)

1.2.3. Frequency Stability ±0.9ppm -40˚C to +85˚C

1.2.4. Frequency Adjustment ±5ppm

1.2.5. External Clock

- 20MHz LVDS
- 10MHz sinus 1Vrms

1.2.6. The Unit will lock automatically lock itself on an input reference

- Nominal external frequency: 20MHz ±1.5ppm MAX
- Lock Time 10Sec.
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2. RX OUTPUT

a. Frequency 70MHz

b. Switching time 100Usec

c. IF output impedance: 50 Ohms.

d. Return Loss: 15 dB Min.

e. Transmit/Receive Isolation: 40dB Min.

f. Reverse isolation at receive mode measure at the antenna Max -90dBm

g. Phase Noise -130dBc/Hz@100KHz from carrier

2.1. Receiving path

2.1.1. Gain 30±2.5 dB Max

2.1.2. Noise figure 8dB MAX (IF Attenuation and Rx Attenuation at minimum)

2.1.3. Input P1dB

- +3.0dBm with 25dB IF Attenuation
- -17dBm with 0dB IF Attenuation

2.1.4. OIP3 +40dBm MIN(Measure at 100 KHz and 1 MHz from the center frequency)

2.1.5. IMAGE AND IF REJECTION

- Image and IF frequency rejection shall be: 90dB minimum.

2.1.6. Spurious

SpuriousInput Frequency [MHz]	Min In Band Spurious [dBc]	Min out of band Spurious [dBc]
30-88	70	80
108-255	70	80
225-400	80	80

2.1.7. Block channel -110dBm @ No RF input measure the 70MHz.

2.1.8. Gain Control 0-31dB 1dB step (Rx and If attenuation)

2.1.9. Carrier to Noise Ratio

Input Signal Power [dBm]	Modulation	Band Width	Spec requirement [dB]
-90	30% AM Mod by 1KHz tone	±1MHz	15
-104	30% AM Mod by 1KHz tone	20KHz	21
TBD	Ultimate C/N	TBD	50

2.1.10. Selectivity

Modulation BW	Distance from center frequency	Min Attenuation [dB]
±1MHz	±1MHz	3
	±2MHz	40
	Ultimate	45
±250KHz	±250KHz	3
	±1MHz	40
	Ultimate	45
±50KHz	±50KHz	3
	±200KHz	60
	Ultimate	65

±10KHz	±10KHz	3
	±50KHz	60
	±100KHz	65
	Ultimate	65

2.2. TRANSMITTING PATH

2.2.1. TX Input

2.2.2. Input Frequency 70MHz

2.2.3. Input Power 0dBm ± 0.5dB

2.2.4. The TX path incorporate “SHAPE ANALOG IN” controls the RF output shape signal.

3. RF TX OUTPUT

Frequency

Band	Frequency Range name	Frequency [MHz]		Step Size [KHz]	Modulation Type	Modulation BW
		Min	Max			
BAND1	LVHF	30	88	8.33, 12.5, 25	AM, FM	±1MHz ±250KHz ±50KHz ±10KHz
BAND2	VHF	108	156	8.33, 12.5, 25	AM,QPSK	
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BAND3	UHF	225	400	8.33, 12.5, 25	AM, FM,QPSK	

3.1.1. Gain

- Gain Variation: ± 0.5dB
- Gain Control: the unit support Rx attenuation 31dB at 0.5dB step.

3.1.2. Stability: Unconditionally Stable

3.1.3. IP3 50dBm MIN @ two tones 10W each 100 KHz apart

3.1.4. Input P1dB = 3dBm

3.1.5. Noise Figure

The output power noise floor MAX =- 160dBc@5MHz from carrier (Noise figure smaller than 14dB for 0dBm input)

3.1.6. On/Off time

- 0.5mSec to 90% of the output power
- 1mSec to 10% of the RF output power.

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3.1.7. Harmonics:

Harmonics shall be suppressed as defined in the following table.

Table 3.2.1-2

Frequency Band	Harmonic Number and Limit Level					
	2ND	**3RD**	**4TH**	**5TH**	**6TH**	**7TH**
30 - 88 MHz	-60	-75	-80	-80	-80	-80
108 – 174 MHz	-60 dBc	-75 dBc	-80 dBc	-80 dBc	-80 dBc	-80 dBc
225 – 400 MHz	-60 dBc	-80 dBc	-80 dBc	-80 dBc	-80 dBc	-80 dBc

3.1.8. Spurious:

All non harmonics spurious emissions shall be at least 80 dB down from the peak power level measured at the fundamental frequency.
Back inter-modulation:

The output port inter-modulation rejection shall be 40dBc Minimum for a 100mW interference signal level, injected into the antenna port, +/-100 KHz away from the carrier frequency.

3.1.9. Power (RMS with power meter)

- 10-15 Watt into 50Ohm Load (VSWR 1:2) Single carrier.
- 20Watt Typical (15.89Watt Min 31.7Watt MAX) (42-45dBm) FM MOD.
- Power at extreme environmental condition

No.	VSWR	Voltage	Temperature	Power
1.	< 1:2	Nominal	Nominal	Nominal
2.	1:3 to 1:4	Nominal	Nominal	- 3dB
3.	> 1:7	Nominal	Nominal	- 7dB
4.	< 1:2	Nominal	-40C to -10ºC	- 2dB
5.	1:2	Nominal	+55ºC to +71ºC	- 2dB
6.	1:2	Nominal	+71ºC to +85ºC	- 5dB
7.	1:2	18Vdc – 22Vdc	-40ºC to +71ºC	- 6dB
8.	Nominal	< 18Vdc, >32Vdc	Nominal	Shut Down

3.1.10. Duty Cycle

Without forced air cooling at 55˚C

- Full Power 20% 1:5 minimum (1 minute transmit to five minutes receive)

With forced air cooling

- CW for 30 minutes at high power (Max RF output power degradation 3dB)

3.1.11. TX Audio Performances

AM audio distortion 5%
Test method: Input Max 1% distortion 90% AM modulation signal and measure 5% distortion. MIN 90% upward and MIN 95% downward.

4. POWER SUPPLY

- Input power supply +28V @ MIL-STD-704-D CAT B.
- Power Consumption
- TX 155Watt Max
- RX 25Watt Max
- Power supply efficiency 85% MIN

5. GUARD RECIVER

5.1.1.1. GUARD RECEIVER CHARACTERISTICS

5.1.1.1.1. Operating bands

- UHF – 243 MHz +/-5 MHz. AM and FM with 25KHz step size.
- VHF - 121.5 MHz +/-5MHz and 156.8 MHz +/-5MHz AM and FM.

with 25KHz step size

- LVHF 40.5 MHz FM (single frequency).

5.1.1.1.2. SENSITIVITY

The sensitivity shall be -103 dBm for an input signal modulated 30% by 1 KHz to produce at least S+N/N=10dB at the audio output.
The sensitivity shall be -106 dBm for an input signal modulated 5.6KHz by 1 KHz to produce at least S+N/N=10dB at the audio output.
Under any combination of service conditions the receiver's sensitivity degradation shall be 6dB max.

5.1.1.1.3. SELECTIVITY

The channel selectivity shall be as follows:

DEVIATION FROM CENTRAL FREQ.	SELECTIVITY (dB)
50Khz	50
250 kHz	60
1 MHz	70
10 MHz	80

5.1.1.1.4. Bandwidth:

- ± 14.0 kHz min. at 6 dB points referenced to the tune frequency.
- ± 40.0 kHz max. at 60 dB points referenced to tuned frequency.

5.1.1.1.5. SQUELCH

a. The guard receiver shall include a C/N operated squelch circuit with means to disable the squelch upon operator's choice.

b. The squelch shall be adjusted to open at S/N 10±5dB (AM), 15 ±5dB (FM). For signals above -80 dBm the squelch circuit shall function as a carrier level activated squelch.

c. SQUELCH Attack and Release Time

Squelch attack time shall not exceed 30 milliseconds. The squelch release time shall be no more than 90 milliseconds.

d. Squelch hysteresis shall be greater than or equal to 2 dB and less than or equal to 6 dB.

5.1.1.1.6. Audio output

5.1.1.1.6.1. The guard receiver shall include two audio outputs:

5.1.1.1.6.1.1. Analog output for calibration and test.

5.1.1.1.6.1.2. Digital output in a PCM - A - Law format connected to the control logic block of the RFC.

5.1.1.1.6.2. All audio measurements shall be conducted on 0 dBm output.

5.1.1.1.6.3. AGC - the AGC circuit shall keep a constant ± 4dB audio output level for input signals in the range of -103 dBm to -7 dBm referenced to the audio level at -53 dBm input signal.

5.1.1.1.6.4. Audio bandwidth shall be (3 dB points referenced to 1 KHz): 300 - 3000 Hz.

5.1.1.1.6.5. Audio distortion (on 600 ohm load) shall not exceed 10% for -53 dBm input signal modulated 30% at 1 KHz and measured at 0dBm output.

5.1.1.1.7. INTERNAL NOISE LEVEL

The signal to noise ratio (modulated to un-modulated signal) shall be at least 30dB for -53dBm AM input signal modulated 30% at 1 KHz and measured at audio outputs.