



# Design Note

From: DEMI R & D Dept.  
 DN#: 031  
 Date: April,15, 2012  
 Re: Utilizing the VHF ApolLO as a Weak Signal Source (WSS)

**PREFACE:** This document will cover the WSS frequencies and set up of the VHF ApolLO

**CIRCUIT UNDERSTANDING:** This document assumes that the “VHF ApolLO Background, Theory of Operation and Test Instructions” have been read. This is a pre-requisite before implementation.

After reading, you should understand that there are only 10 WSS frequencies covering from the 4 Meter band to 23 cm. Also understand that the base frequency of the synthesizer when in the WSS mode is between 70 and 76 MHz. All WSS frequencies that are generated except for the 4 Meter band are based on harmonics of those base frequencies.

To start the set up of the VHF ApolLO for the WSS mode, the L6 inductor (which sets the range of the synthesizer) should be removed (2.2nH) and replaced with a supplied 8.2 nH. Then the basic programming can be performed by shorting programming positions 4-7. (4 total) See program chart.

Band	Freq.	WSS	Mult.X	IF	Actual Frequency	8.2	—	A	Strap Positions							
									7	6	5	4	3	2	1	0
1.25M	220.1	WSS	3	IF	73.36667	8.2	—	A	X	X	X	X				X
1.25CM	222.1	WSS	3	IF	74.03333	8.2	—	A	X	X	X	X				X
70CM	432.1	WSS	6	IF	72.01667	8.2	—	A	X	X	X	X			X	X
70CM	435.1	WSS	6	IF	72.51667	8.2	—	A	X	X	X	X		X		
33CM	903.1	WSS	12	IF	75.25833	8.2	—	A	X	X	X	X		X		X
33CM	902.1	WSS	12	IF	75.175	8.2	—	A	X	X	X	X		X	X	
23CM	1296.1	WSS	18	IF	72.00556	8.2	—	A	X	X	X	X	X			
2M	144.1	WSS	2	IF	72.05	8.2	—	A	X	X	X	X	X			X
2M	144.2	WSS	2	IF	72.1	8.2	—	A	X	X	X	X	X		X	
4M	70.1	WSS	1	IF	70.1	8.2	—	A	X	X	X	X	X	X		

Any frequency may be selected individually. All positions with single extra connection may be selected with a 4 position switch to ground but will only select 220.1, 222.1, 435.1 and 1296.1 MHz. If all 10 Frequencies are desired (as with the DEM VHF WSS) a Single Pole, 10 throw switch and 12 steering diodes are required. It is best to make all diode connection on the switch and run the 4 single

wires to the VHF Apollo to the strap positions vias, 0 -3. Then select which frequency desired to selector switch position.

To complete the assembly, a multiplier diode and return path inductor should be installed to the output pad of the synthesizer. This will enable the harmonics. See Design Note #026 for similar assembly. Increase the inductor size by a minimum of 3 turns.

Greatest accuracy will be achieved with a quality 10 MHz source. But if accuracy is not an issue, a 10 MHz clock may be installed on the VHF Apollo with expected frequency drifting due to temperature change. Consult DEMI for the correct clock.

**UTILIZING THE VHF APOLLO:** Understand that since all frequencies are derived from harmonics (except 4M), strong signal levels will always be present. The output power of the VHF Apollo is approximately - 3 to -5 dBm. This level may be too high, for instance, if you wish to directly connect the WSS to a LNA or low level amplifier. Any particular frequency may be selected without the base frequency or other related harmonics by utilizing a Band pass filter. Please consult the list below for approximate levels at the ham band frequency.

FREQUENCY in MHz.	LEVEL in dBm
70.100	-5
144.100	-20
144.200	-20
220.100	-10
222.100	-10
432.100	-30
435.100	-30
902.100	-36
903.100	-36
1296.100	-43