

Overview of the 50MHz QRP AM Transceiver

DDS VFO for both TX and RX
Control by PIC microcomputer
AM modulation QRP TX
Double supper heterodyne RX

Frequency Range (1) 50.650MHz Center (2) 50.550MHz Center
+/- 60KHz

Power Supply
11V to 14V

Key components
MPU PIC16F84
DDS AD9851BRS

Operating Switch
TX/RX Select TX/RX
Frequency Select CH1 and 2
Frequency Tune UP/STAY/DOWN +/- 60KHz
RIT On/Off +/- 10KHz

LED Indicator
Power RED(TX)/GRN(RX)/WHT(OFF)
Frequency RED(DOWN)/GRN(UP)/WHT(CENTER)
Fre. Morse Only show 100KHz,10KHz and 1KHz data

Frequency relationship

Relation between TX and RX Frequency

RX	VFO/DDS	1st IF	Xtal	2nd IF
50.650000	45.134100	5.515900	5.064590	0.455000
50.710000	45.194100	5.515900	5.064590	0.455000
50.590000	45.074100	5.515900	5.064590	0.455000
50.550000	45.034100	5.515900	5.064590	0.455000
50.610000	45.094100	5.515900	5.064590	0.455000
50.490000	44.974100	5.515900	5.064590	0.455000

Base Clock

Xtal(MHz)	x n	Base Clock
30	6	180

Frequency data

$$N = \text{int}(F_{\text{out}}/F_{\text{clk}}) \times 2^{32}$$

$$2^{32} = 4294967296$$

$$N = \text{int}(F_{\text{out}} \times 4294967296) / F_{\text{clk}}$$

Set Frequency(MHz)	Hex data	Decimal data	Comments
0.000050	00000004A9	1193.05	Freq. Seep step
45.134100	004030D306	1076941574.64	TX=50.65MHz
45.034100	00400C6A59	1074555481.69	TX=50.55MHz
5.515900	0007D84724	131614500.60	Freq. Offset between TX&RX
0.060000	000015D867	1431655.77	Off Set max.
0.010000	000003A411	238609.29	Off Set max.
0.000100	0000000952	2386.09	Off Set max.
0.000001	0000000017	23.86	Off Set max.

Frequency Calculation

$$f_t = f_b + F_o$$

$$f_r = f_b \pm f_i$$

$$f_b = F_c \pm f_v$$

$$f_i = f_i \pm 10\text{Hz} \quad (f_i = 0 \text{ to } 10\text{KHz})$$

$$f_v = f_v \pm 10\text{Hz} \quad (f_v = 0 \text{ to } 60\text{KHz})$$

f_t ;Transmit frequency

f_r ;Osc frequency for Receiver

f_b ;Base frequency for common

F_c ;Center frequency

F_o ;Offset frequency between TX and RX

f_v ;Variable frequency for turning

f_i ;RIT offset frequency for RX

50MHz TRX

Function	PIC16F84			AD9851			Function
	Pin #	Pin Name	In/Out	Pin #	Pin Name	In/Out	
DDS CLK/DDS Reset	1	RA2	O	22	RESET	I	
LED1/Red/TX	2	RA3	O				
Switch0/CH_Select	3	RA4/T0CLK1	O				
+5V	4	/MCLR	x				
Ground	5	VSS	x				
DDS DATA/DDS Serial data	6	RB0	O	25	D7	I	LED1/Green/RX
DDS CLK/DDS clock	7	RB1	O	7	W_CLK	I	LED3/Disp/Red
DDS FUD/DDS frequency update	8	RB2	O	8	FQ_UD	I	
LED3/Disp/Green	9	RB3	I				
Switch0/RIT	10	RB4	I				
Switch1/TX_RX	11	RB5	I				
Switch2/UP	12	RB6	I				
Switch2/DOWN	13	RB7	I				
+5V	14	VDD	x				
XTAL 4MHz	15	OSC1	I				
XTAL 4MHz	16	OSC2	O				
LED2/Red/DWON	17	RA0	O				
LED2/Green/UP	18	RA1	O				
Ground				1	D3	I	
Ground				2	D2	I	
+5v				3	D1	I	
+5v				4	D0	I	
Ground				5	DGND	x	
+5v				6	DVDD	x	
Clock 30MHz				9	CLKIN	I	
Ground				10	AGND	x	
+5v				11	AVDD	x	
3.92Kohm Pull-Down				12	Rset	I	
N.C.				13	QOUT	O	
N.C.				14	QOUTB	O	
Ground				15	VINN	I	
+5v				16	VINP	I	
10uF to +5V				17	DACBL	I	
+5v				18	AVDD	x	
Ground				19	AGND	x	
Out/50Ohm				20	IOOUTB	O	
Out/25Ohm				21	IOOUT	O	
+5v				23	DVDD	x	
Ground				24	DGND	x	
Ground				26	D6	I	
Ground				27	D5	I	
Ground				28	D4	I	