GLB ELECTRONICS MODEL SS1A
Data sheet

MODEL SS1A DESCRIPTION

The Model SS1A was designed as one of several oscillator options for the GLB receiver and transmitter strips. Its intended use is to substitute for a crystal oscillator strip at a cost competitive with an oscillator strip with crystal(s). The SS1A has several advantages over crystal oscillators.

1. Multiple channels. By means of switches, diode matrices or computer control any frequency can be selected, within the limitations of tuning range and frequency step resolution.

2. Programmability. Although synthesizers are thought of as multi-channel devices a good case can be made for their use even in single-channel applications.

* Continuous frequency coverage. The SS1A can be programmed to any frequency within its tuning range in single-channel installations. Interpolation between channel steps is continuous by means of a fine adjustment of the reference frequency crystal oscillator. For single-channel installations that eliminates the problems of crystal purchasing, with the attendant problems of waiting and obtaining units with correct specifications, etc. Channel changing is accomplished simply by reprogramming it on the spot. The initial cost is the only crystal cost ever incurred.

* Modulation capability. In transmitters FM modulation can be applied directly to the synthesizer with predictable deviation levels and far lower distortion than is possible by direct modulation of crystal oscillators or phase modulators.

* Reference standards. If many receivers and transmitters are used at a single site all can be synchronized to an external high-stability master reference oscillator. Individual units never need adjustment to frequency, since the master oscillator determines their accuracy. Frequency drift and off-frequency distortion become a thing of the past.

FREQUENCY RANGES

MODEL	FREQ RANGE, mhz	STEP SPACING, khz	MULTIPLIER
SS1A-144	120 to 163	10	X6
SS1A-220	180 to 230	20	X9
SS1A-450	380 to 480	50	X18

The fundamental output frequency is in the range 20 to 30 mhz, and it is multiplied to the output range by the value listed under "MULTIPLIER". Other frequency ranges are easily covered by tuning the VCO slug.

TYPICAL PERFORMANCE

Spurious outputs	less than 70 db below carrier.
Incidental modulation	less than 50 hz
Stability	+- 0.001%, -10 to +50°C.
Lock time	less than 10 ms, 1 mhz step
Frequency control	14 binary control lines.
Output power	more than 4 mw into 50 ohms
Supply voltage	+11-15 volts DC, less than 20 ma.
Size	1.25"W X 4.5"L X 1"H

GLB ELECTRONICS MODEL SS1A SYNTHESIZER SUBASSEMBLY

The model SS1A is intended as a signal source for our receiver and transmitter subassemblies, but it can be adapted to other equipment. The basic output frequency is about 24 mhz. For 50 mhz operation the output is doubled, for the 144 mhz band the signal is multiplied by 6, for 220 mhz by 9 and for 450 mhz by 18. Most commercial receivers and transmitters can be adapted for drive in this range.

ASSEMBLY

[ ] (1) FIRST, check the parts against the "QUANTITY" column in the parts list, with a mark in the "( )" provided. Report any shortages to GLB immediately.

[ ] (2) Assemble the circuit board, inserting the parts as they're called out on the ASSEMBLY CHART, starting at step 1.

Keep all component leads (except X1) short. Disc capacitors should be touching the top surface of the board.

Note 1: Make sure the trimmer capacitor is oriented correctly.
Note 2: Q1 may be a 2N3563, PN3563 or MPS3563.
Note 3: Leave 1/8" of space between the crystal and the surface of the board.

[ ] (3) Solder R13 to the trace side of the board as shown fig. 1.

[ ] (4) Solder R14 across L2 as shown in the board layout on the chart page. Keep the leads short.

[ ] (5) Check your work. Is everything in the right place? You may avoid a lot of frustration if you recheck the values of all parts now! Any unsoldered joints? Coils oriented correctly?

[ ] (6) The VCO shield can be left off until preliminary testing is done.

[ ] (7) There are traces between pins 5, 6 and 7 to ground. For model SS1A-144, cut all three traces (pins 5, 6 and 7 have no connection). On Models SS1A-220 and -450 cut only the traces from pins 6 and 7.

[ ] (8) Follow the TEST PROCEDURE. When finished, mount the VCO cover in place.

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figure 1

PARTS LIST FOR GLB ELECTRONICS MODEL SS1A SYNTHESIZER

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RESISTORS	DESCRIPTION	QUANTITY		COLOR CODE
R1	100K ohm carbon 1/4W	( )	1	brown-black-yellow
R2	220K ohm carbon 1/4W	( )	1	red-red-yellow
R3	39K ohm carbon 1/4W	( )	1	orange-white-orange
R4	4.7K ohm carbon 1/4W	( )	1	yellow-violet-red
R5	1K ohm carbon 1/4W	( )	2	brown-black-red
R6	10K ohm carbon 1/4W	( )	1	brown-black-orange
R7	220 ohm carbon 1/4W	( )	1	red-red-brown
R8	1K ohm carbon 1/4W			
R9	1M ohm carbon 1/4W	( )	2	brown-black-green
R10	470 ohm carbon 1/4W	( )	1	yellow-violet-brown
R11	1M ohm carbon 1/4W			
R12	47K ohm carbon 1/4W	( )	1	yellow-violet-orange
R13	1M ohm carbon 1/8W	( )	1	brown-black-green
R14	2.2K ohm carbon 1/8W	( )	1	red-red-red

CAPACITORS	DESCRIPTION	QUANTITY	
C1,C17	33 pf NPO ceramic	( )	2
C2	5-25 pf ceramic	( )	1
* C3	47 pf NPO ceramic	( )	1
C4	.01 uf ceramic	( )	4
C5	1 uf 35 V tantalum	( )	1
C6-C7	.01 uf ceramic		
C8	2.2 uf 35 V tantalum	( )	3
C9-C10	.001 uf ceramic	( )	5
C11	150 pf ceramic	( )	1
C12	.01 uf ceramic		
C13	2.2 uf 35 V tantalum		
C14-C16	.001 uf ceramic		
C18	2.2 uf 35 V tantalum		

INDUCTORS		QUANTITY		
L1	1.0 uh choke	( )	2	brown-black-gold
L2	Slug-tuned coil	( )	1	
L3	1.0 uh choke			

TRANSISTORS		QUANTITY	
Q1	MPS3563	( )	1
Q2	2N5485	( )	1
Q3	MFE521	( )	1
Q4	MPSA13	( )	1

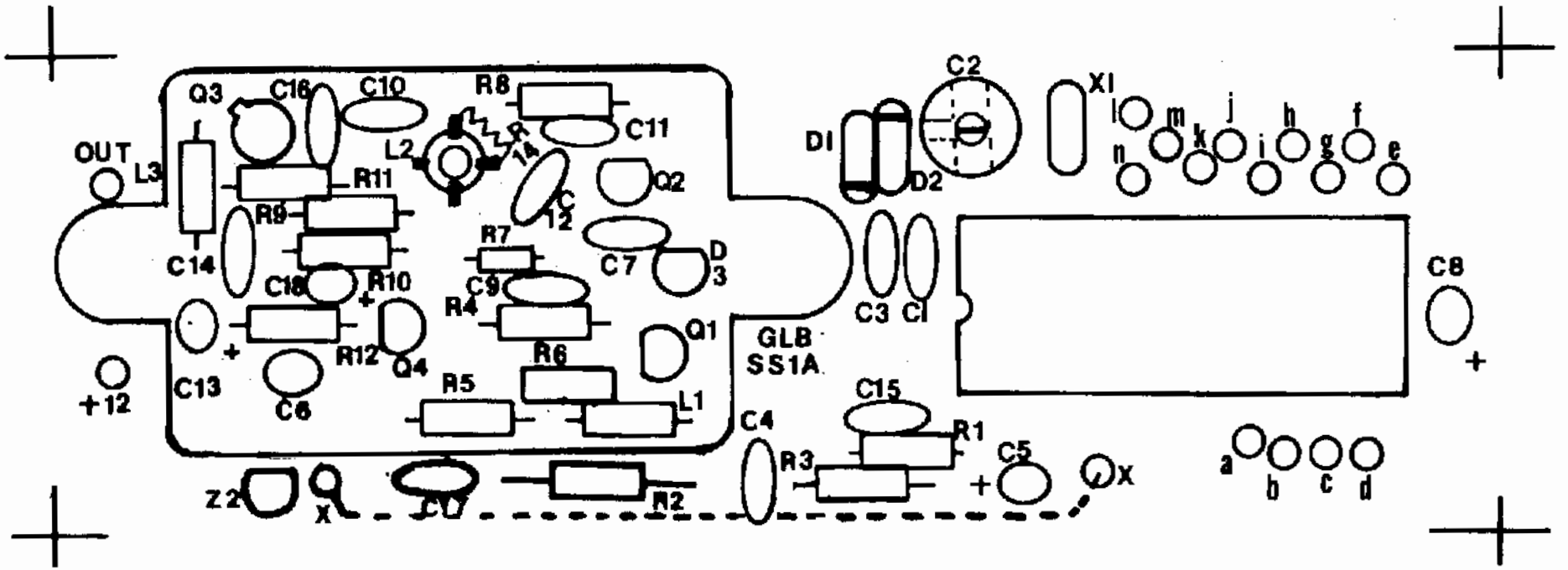
DIODES		QUANTITY	
D1-D2	1N4148	( )	2
D3	MV2209	( )	1

INTEGRATED CIRCUITS		QUANTITY	
Z1	145151	( )	1
Z2	78L08	( )	1

MISCELLANEOUS

X1	Crystal	( )	1
	VCO cover	( )	1
	#4-40 X 1/4 screws	( )	2
	#4-40 X 3/8 standoffs	( )	2
	#4 lockwashers	( )	2
	circuit board		
	instructions		

End of list



GLB ELECTRONICS MODEL SS1A ASSEMBLY CHART

Step	Item number	Value	Check
1	R1	100K	
2	R2	220K	
3	R3	39K	
4	R4	4.7K	
5	R5, R8	1K	
6	R6	10K	
7	R7	220 ohm	
8	R9, R11	1M	
9	R10	470	
10	R12	47K	
11	C1	33 pf	
12	C2 (note 1)	5-25 trim	
* 13	C3 (150 pf 220 (450)	47 pf (144)	
14	C4, C6, C7, C12	.01	
15	C5	1 uf	
16	C8, C13, C18	2.2 uf	

Step	Item number	Value	Check
17	C9, C10, C14, C15, C16	.001	
18	C17	33pf	
19	C11	150 pf	
20	(X-X)	jumper	
21	D1, D2	1N4148	
22	D3	MV2209	
23	Q1 (note 2)	2N3563	
24	Q2	2N5485	
25	Q3	MFE521	
26	Q4	MPSA13	
27	L1, L3	1 uh	
28	L2	4-pin coil	
29	Z1	TM5151	
30	Z2	78L08	
31	X1 (note 3)	crystal	

TEST PROCEDURE

(1) Refer to "PROGRAMMING" section and connect jumpers for the desired frequency.

(2) With the frequency programmed, connect a counter to the output cable of the SS1A and a 12-volt DC source to the positive power input.

(3) Apply power and check voltage at pin 3 of Z1. It should read 8 volts. If not, turn off power and look for the trouble.

(4) Observe the counter. There should be an output somewhere in the 20 to 40 mhz range, but not necessarily the desired frequency.

(5) Connect a high-impedance (at least 20K/V) DC voltmeter to pin 4 of Z1.

(6) Adjust the slug until a reading of 2 volts is obtained. Failure of the slug to change the reading significantly can be caused by a wiring error, a bad part or the wrong frequency programming jumpers. The output frequency should be very close to the desired frequency at this point.

(7) Disconnect the meter. Using an insulated tuning tool adjust the trimmer capacitor to obtain the exact output frequency. Note that this is a fine-tuning adjustment of just a few khz. If the frequency is too far off, recheck the programming.

(8) As a final check, temporarily ground the lowest-letter unused programming pad and check that the frequency steps to another channel. Then unground it and it should return.

-- The SS1A is now functional and ready to be installed. --

PROGRAMMING

After construction, before the unit can be tested, it must be programmed to frequency. Frequency is selected by jumpering pads a-n to ground in various patterns. If a number of frequencies is desired set it to the lowest frequency in the range.

Each control line is returned to an 8 volt level via a 220K (approx) pull-up resistor. In order to set the frequency, divide the output frequency desired (at the output/input of the transmitter/receiver) by the step spacing for that band (see Table 1). For example, a 2-meter application requires a transmitter output of 146.94 mhz, or 146940 khz, and step spacing is 10 khz:

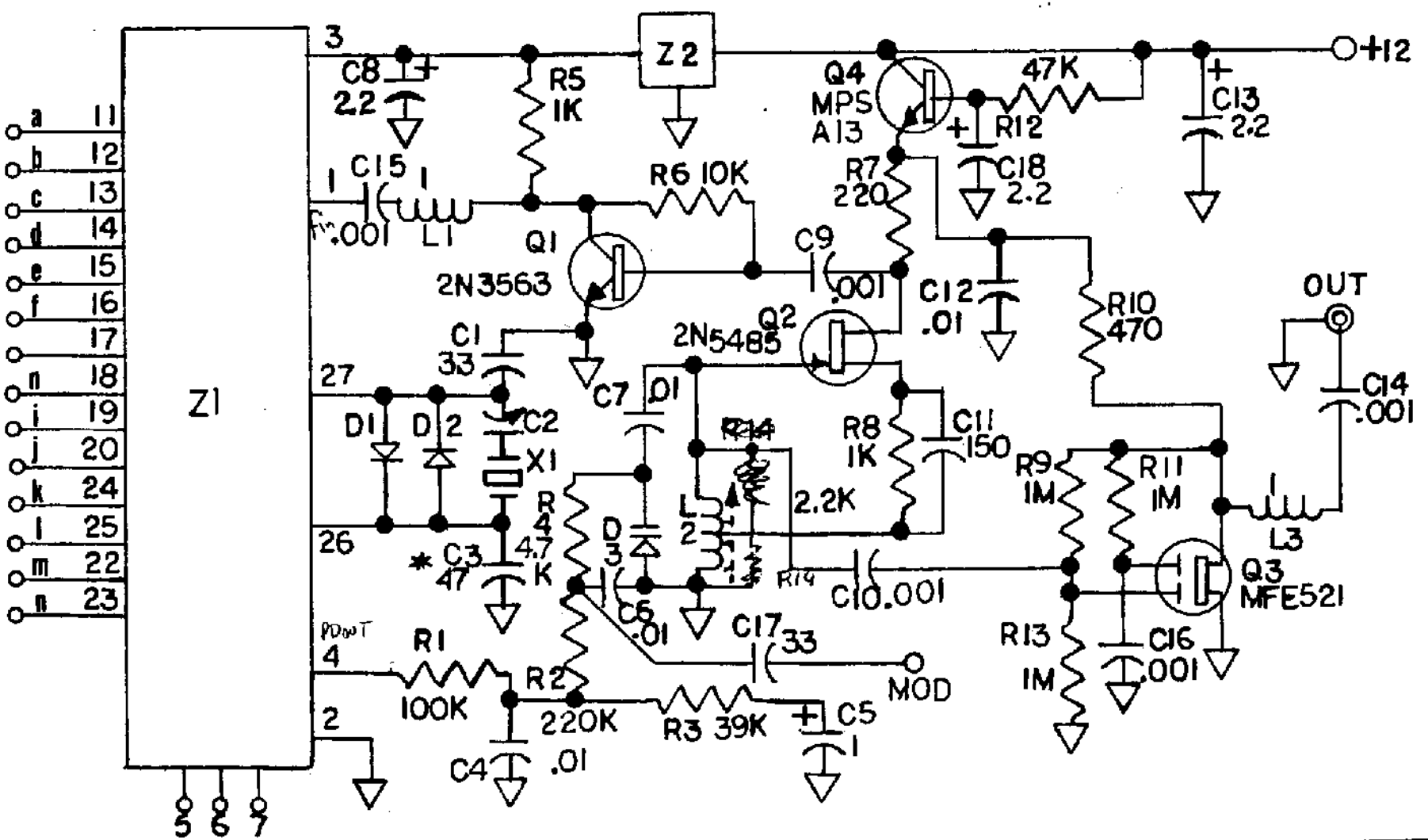
146940/10 = 14694

Next, convert N to a binary number. (Decimal-to-binary conversion is beyond the scope of this writing) The number 14694 is 11100101100110 in binary form. Lines "a" thru "p" correspond to bits of the binary number. Observe that terminal "a" corresponds to the rightmost digit of the binary number (the least-significant bit). For this example a, d, e, h, j and k are grounded. Since the 1's are left floating, b, c, f, g, i, m, n and n are left open.

For this example the frequency counted at the SS1A output is 24,490 khz, since the output is multiplied by 6 to the band of interest.

The connections to ground can be provided by soldering jumpers, switches or digital control. If 5-volt logic is used to drive the control lines, it must be an open-collector type to allow the lines to rise to 8 volts when open.

SSIA	4-22-83
GLB	



* 150 pf / 220 pf 450