8. For maximum output into the ether your antenna itself must match your antenna coaxial feedline and the 23/S-NINE is the only transmitter that will help you do that. Switch to "Reflected Power." Put transmitter on the air and note meter reading. Any increase in meter reading from reflected reading found and noted in Step 7 will indicate a mismatch between your antenna and the coaxial cable. A slight mismatch is tolerable and will not affect your transmission to any noticeable extent. A mismatch between antenna and transmission line causes some power to be reflected back from the antenna instead of being radiated into the ether. These are known as standing waves and waste part of your power. To find out how much power is being wasted refer to the Formula below:

$$\frac{If + Ir}{If - Ir} = \text{S. W. R.}$$

Standing Wave Ratio

If = DIFFERENCE between minimum and maximum - found in Step 7

Ir - DIFFERENCE between minimum found in Step 7 and minimum found in Step 8

Suppose we had a minimum reading of 10 in Step 7, the maximum was 100 and the difference therefore is 90, thus If becomes 90. With the antenna connected the minimum reading is 20, therefore, the difference between minimum readings in Step 7 and minimum readings in Step 8, is 10 and Ir is 10. By formula -

$$\frac{90 + 10}{90 - 10} = \frac{100}{80} = 1.25$$

which means that the S W R is 1.25 to 1 and very acceptable. Any S W R less than 2 to 1 is good and anything less than 3 to 1 is not worth the trouble necessary to correct. For methods of reducing the Standing Wave Ratio, with the many types of specially constructed antennas available you will have to consult Antenna Handbooks such as published by the American Radio Relay League, West Hartford, Conn., or get the information from the manufacturer of your particular antenna. By following whatever methods recommended for matching your particular antenna to your transmission line the indication of reflected power found in your 23/S-NINE eliminates your purchasing expensive S W R meters. Practically all commercial made antennas are designed to match 52 ohm co-ax line.

SERVICING INSTRUCTIONS

The following operations according to law can only be performed by a person holding a Second Class Commercial Radio Telephone License, or a license of a higher rating. Adjustments by an unauthorized person automatically voids our warranty.

PRELIMINARY ADJUSTMENTS

A. Dummy load of 50 - 52 ohms.
B. AC switch on.
C. Make sure crystals are in proper sockets.

OSCILLATOR AND BUFFER TUNING

A. Hang VTVM on Pin 2 (grid of V4) 6EA8.
Tune L3 (oscillator) for ~~-6VDC~~. -5 VDC
B. Hang VTVM on pin 9 of V5 (5763).
Tune L4 to peak - Volts on VTVM Neg. DC.

FINAL TUNING

Meter switch on forward power position.

A. Use three crystals - High, Low and Middle of band.
B. Start with middle of band crystal. Tune C27 (plate tuning) and C28 (Antenna Tuning) repeat several times on both because of interaction for maximum power output.
C. Check low and high crystals at this time. If the output at one end of the band is lower than the other tune the plate tuning C27 to favor the lower output, now switch to middle of band and retune the antenna C28 to the middle of the band. Repeat these steps until the ends are equal in power. The final adjustment should always be the antenna in the middle of the band. Now carefully retune the Buffer (L4) Coil.

SYSTEMS CHECK

Plug 23/S-NINE with two interconnecting cables into Receiver and check for no loss in receiver rush.

Increase Mod. pot R10 to maximum clockwise position and back off 1/4 turn. Check for proper amount of audio on oscilloscope or by talking with some one on the air.

Check for spot frequency operation by pushing spot switch and selecting different crystals. In tuning the oscillator and buffer coils it is important to use the proper plastic hex drive. If a screwdriver is used the cores will be cracked and permanent damage will result to the coils.

Control R11 is used for obtaining the deepest null when reading reflected power with a Dummy load fastened to the output of the transmitter.

Proceed as follows:

Adjust Potentiometer R11 for lowest reading against the Dummy load supplied, or a non-inductive load of 50 - 52 Ohms across the coaxial output connector of the transmitter.

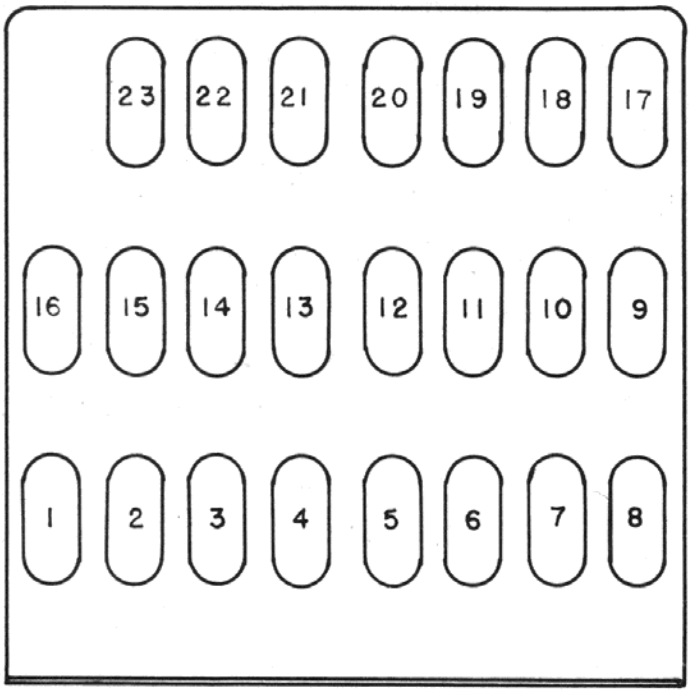
This may not read zero. In every case, however, adjust for the lowest reading obtainable with power on, meter switch in reflected power position.

2 3
S - N I N E

PARTS LIST

Schematic No.	Description	Part No.
R13	10 Ohm C. Resistor 1W 10%	23 - 1
R32	100 " " " ½W "	23 - 2
R23	220 " " " 1W "	23 - 3
R5 - R29	2200 " " " ½W "	23 - 4
R37	10 K " " " " "	23 - 5
R30	15 K " " " " "	23 - 6
R28	18 K " " " " "	23 - 7
R27	33 K " " " " "	23 - 8
R24-R25-R4	47 K " " " " "	23 - 9
R6- R1	270 K " " " " "	23 - 10
R2-R7-R22-R35	470 K " " " " "	23 - 11
R3	1 Meg " " " " "	23 - 12
R8	1.5 K " " " 1W "	23 - 14
R20	10 K " " " " "	23 - 15
R26	22K " " " " "	23 - 16
R14 - R39	33K " " " " "	23 - 17
R31	39K " " " " "	23 - 18
R16	250 Ohms Wire Wound 4W "	23 - 19
L1	6 hy Filter Choke	23 - 20
R12	5 K Pot. Linear ½W Carbon ½"Shaft	23 - 21
R10	500 K Pot. " ½W " S.D. "	23 - 22
R11	100 Ohm " ½W " " "	23 - 23
C34	5 mmf Dip Mica Cap 10% 500 V	23 - 24
C17 - C22	10 " " " " " "	23 - 25
C32	12 " " " " " "	23 - 26
C20	15 " " " " " "	23 - 27
C7 - C8	100" " " " " "	23 - 28
C23	220 mmf Disc. Cer. Cap "	23 - 29
C1- 2 - 3 -5	.001 mfd " " " "	23 - 30
9 - - 18		
19- 21 - 24		
25- 26 -29-31		
C10	.005 mfd Disc. Cer. Cap 500V	23 - 31
C12	.01 " " " " "	23 - 32
C11	.04 " " " " "	23 - 33
C13	40 mfd Tub. Elec. 250V	23 - 34
C4=A-B	20/450 20/450 Tub. Elec.	23 - 35
C14-A-B-C	40-40-40 Can Type Elec.All@450V	23 - 36
C28	Mica Padder-100-500 mmf	23 - 37
C27	APC 25 mmf Var. Cap.	23 - 38
C6	470 mmf Dip Mica 10% 500V	23 - 39
C4C	25 mfd 25V	23 - 40
L6	18 uh Choke	23 - 41
L3 - L4	1 uh Coil	23 - 42
L7	TVI Trap	23 - 43
L5	Pi Net Coil 1.4 UH 9Turn 3/4" D	23 - 44

Schematic No.	Description	Part No.
L2	Audio Choke	23 - 45
T2	Mod. Transformer A171	23 - 46
T1	Power Transformer	23 - 47
S3	Momentary Switch Open 1 Close 1	23 - 48
S1	SPST A.C. Toggle Switch	23 - 49
S2	SW.-3 Circuit 3 Pos. 1 Sec.Rot.	23 - 50
S4	SW. 23 Pos. $\frac{1}{2}$" Shaft	23 - 51
K1	3 P D T - 10K Ohm Relay	23 - 52
	Stand Off Insulator (PiNet)	23 - 53
CR 24	1N67 Diode	23 - 54
CR 25	1N67 Diode	23 - 55
SR1 - SR2	Silicon Rectifier	23 - 56
V1	12 AX7 Tube	23 - 57
V5	5763 Tube	23 - 58
V3	6BQ5 Tube	23 - 59
V4	6EA8 Tube	23 - 60
V2	12AU7 Tube	23 - 61
I2 - I1	GE 47 Lamp	23 - 62
CR1	Transmit Crystal	23 - 69
J1	Coax Recep. Chassis Amphenol 83 - 1R	23 - 70
J2	Coax Recep. Chassis " 31-002	23 - 71
P1	Coax Plug Amphenol 83-1 SP	23 - 72
P2	Coax Plug " 31-102	23 - 73
J3 - P3	Octal Plug	23 - 74
	Octal Socket	23 - 75
M1	0-1 MA Meter	23 - 76
F1	2 Amp Fuse	23 - 77
FH1	Fuse Holder	23 - 78
	9 Pin Bakelite Socket	23 - 79
	Cer. Crystal Socket	23 - 80
	Pilot Light Socket	23 - 81
	Meter Light Socket	23 - 82
LC1	Line Cord (AC)	23 - 87
MC1	Microphone - Push to talk SW.	23 - 88
	Leg Spacers A 161	23 - 89
	Rubber Feet	23 - 90
	Knob - 180° Scribe A 166 - 3	23 - 91
	Knob Plain A 166	23 - 92
	Strain Relief Bushing	23 - 93
J4	Mic. Socket Amphenol 80 PC-2F	23 - 94
P4	Mic. Plug Amphenol 80 MC-2M	23 - 95
	Shaft Coupling 1/4" x 3/4"	23 - 96
	Panel Bushing 1/4" x 3/8"	23 - 97
	1/4" Fibre Shaft $5\frac{1}{4}$" Long	23 - 98
	S.W.R. Can Browning	23 - 99
	Switch Bracket A 221	23 - 100
	Pi Net " A 198	23 - 101
	Trim Plate A 218	23 - 102
	Front Panel A 217	23 - 103
	Top Cover A 175	23 - 104
	Chassis A 220	23 - 105
	Bottom Plate A 219	23 - 106
	Crystal Bracket A 214	23 - 107
	Dummy Load	23 - 108



CRYSTAL LOCATIONS IN S-NINE 23

Location of crystals looking from the rear of the transmitter towards the front panel, are as shown on the above diagram.

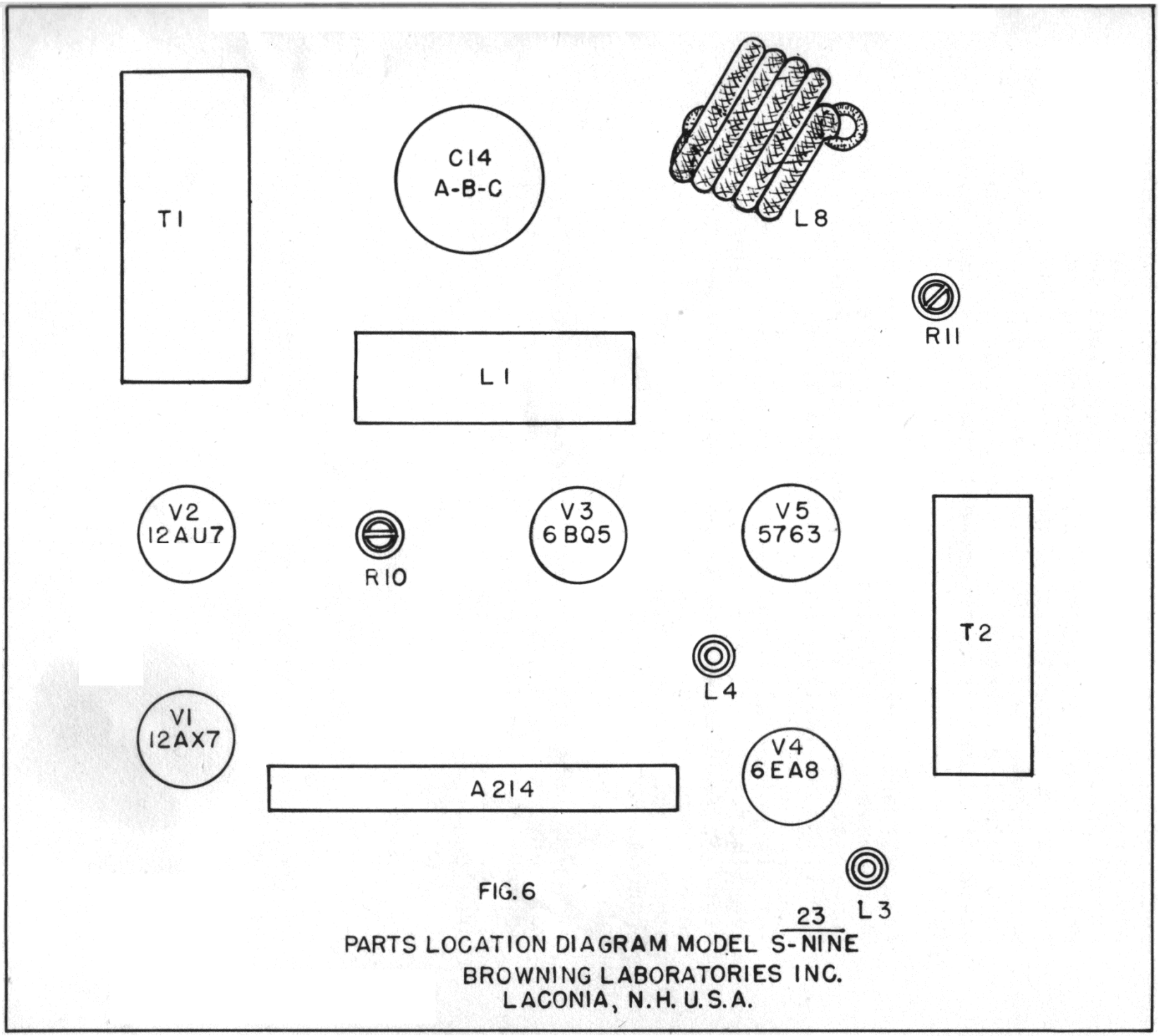


FIG. 6

PARTS LOCATION DIAGRAM MODEL S-NINE

BROWNING LABORATORIES INC.
LACONIA, N.H. U.S.A.

WARRANTY

Browning Laboratories, Inc., warrants each new intercommunicating device manufactured by it to be free from defective material and workmanship and agrees to remedy such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use and service discloses such defect - provided the unit is delivered by the owner to us or to our authorized distributor or dealer from whom purchased within 90 days from the date of sale to original purchaser, and provided that such examination discloses in our judgment that it is thus defective.

This warranty does not extend to any of our products which have been subjected to misuse, neglect, accident, incorrect application, improper installation, or use in violation of instructions furnished by us.

This is not an all-encompassing or performance guarantee (see instructions) and this Warranty is in lieu of all other Warranties expressed or implied; and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

Browning Laboratories, Inc. reserves the right to make any change in design, or to make additions and improvements in its products without imposing any obligation on itself to install them in its products previously manufactured.

BROWNING LABORATORIES, INC.

LACONIA, N. H.

Manufacturers of --

FM-MULTIPLEX EQUIPMENT

MICROWAVE TEST INSTRUMENTS

-- KLYSTRON POWER SUPPLIES

-- SWR AMPLIFIERS

SPECIALIZED TEST INSTRUMENTS

FREQUENCY MODULATION MONITORS

WWV RECEIVERS

AMPLIFIERS

VARIOUS SPECIAL PURPOSE RECEIVERS

FM BROADCAST MONITOR & RELAY RECEIVERS

CITIZENS BAND COMMUNICATIONS RECEIVERS

AND TRANSMITTERS