

To buy, sell, rent or trade-in this product please click on the link below:
<http://www.avionteq.com/TKM-Michel-NC-2210-NAV-COM-Ramp-Tester.aspx>



www.avionteq.com

1

INSTRUCTION MANUAL
FOR
2210 NAV-COMM RAMP TESTER

TKM, INC
14811 N. 73RD STREET
SCOTTSDALE, AZ 85260

PART # IMN2210, REV., 1
OCT. 10, 2003

TABLE OF CONTENTS

I. Product Description	3
A) Specifications	3
II. Operation	4
III. Functional Description	
IV. Alignment	6
V. Calibration	
VI. Hardware Description (Disassembly)	7
VI. Schematics, Layouts & Parts List	8

I. PRODUCT DESCRIPTION

The TKM NC 2210 is a NAV-COMM Ramp Tester. It provides test signals for Localizer, Glide Slope, VOR, Marker Beacon and Comm. The signals may be radiated or connected directly to the unit under test. A demodulated signal is available for direct connection to some converters.

The unit has improvements over the NC 2200 which it replaces. The improvements include the following:

- Higher RF power
- Precise localizer and glide slope deflection
- Calibrated VOR bearings at 10 degree increments.
- Crystal controlled modulation frequencies
- Longer battery life
- Internal antenna with adjustable length
- Smaller size

A) SPECIFICATIONS

- LOCALIZER:** 108.1 MHz +/- .003%
 0 +/- 3 dbm at base of antenna.
 Deviation: Centered, +/- .047 DDM, +/- .094 DDM, +/- .15 DDM
 Tone delete: 90 and 150 Hz with undeleted tone at 20%.
- GLIDESLOPE:** 334.7 MHz +/- .003%
 -6 +/- 3 dbm at base of antenna.
 Deviation: Centered, +/- .094 DDM, +/- .188 DDM, +/- .30 DDM
 Tone delete: 90 and 150 Hz with undeleted tone at 40%
- ILS** Both the Localizer and Glide slope signals as above.
 Deviation: Both signals deviated simultaneously.
- VOR** 108.0 MHz +/- .003%
 0 +/- 3 dbm at base of antenna.
 Bearing: Selectable in 10 degree increments.
- MARKER:** 75.0 MHz +/- .003 %
 Modulation: 400, 1300, 3000, 1020 Hz @95% - CW or pulsed.
- COMM:** 118.0 MHz +/- .003%.
 Modulation: 400, 1300, 3000, 1020 Hz @ 30%.
 Transmitter test: -10 to + 10 dbm Go-Nogo. Phones to check modulation.
- SIZE:** 3.8 X 7.4 X 2.3 Inches
- WEIGHT:** 1.3 Lbs.
- POWER:** Internal Battery with over 2 Hours running time.

II. OPERATION

The NC2210 is operated with two selector switches. It also has three LED displays to indicate the selected operating conditions. The FUNCTION switch has 11 positions.

1. Power control: turn off power.
2. LOC: Selects 108.1 MHz RF. (CHANNEL displays 108.1)
3. GS: Selects 334.7 MHz RF. (CHANNEL displays 108.1 for the paired channel)
4. ILS: Selects both 108.1 MHz and 334.7 MHz. (CHANNEL displays 108.1)
5. VOR-0: Selects 108.0 MHz RF. (CHANNEL displays 108.0) Bearing is 0 nominal.
6. VOR-90: Selects 108.0 MHz RF (CHANNEL displays 108.0) Bearing is 90 nominal.
7. VOR-180: Selects 108.0 MHz RF (CHANNEL displays 108.0) Bearing is 180 nominal.
8. VOR-270: Selects 108.0 MHz RF (CHANNEL displays 108.0) Bearing is 270 nominal.
9. MB: Selects 75.0 MHz RF; (CHANNEL displays 75.0)
10. COMM: Selects 118.0 MHz RF. CHANNEL displays 118.0)
11. TX: Transmitter Test. (Channel displays No Power ////) (Power ////).

The MODULATION SELECT switch has 9 positions. The center position provides the nominal operating conditions.

For localizer, glide slope and ILS the "0" position provides balanced 90 and 150 modulation. "1" provides a .047 DDM for localizer and a .094 DDM for glide slope with 150 greater than 90. "-1" provides the reverse of the 90 and 150 levels. "2" provides .094 and .188 DDM with the 150 greater then 90 and "-2" provides the reverse of the 90 and 150 levels. "3" provides .150 and .300 DDM eith the 150 greater than 90 and "-3" provides the reverse of the 90 and 150 levels. "4" provides 150 Hz at 20% for LOC and 40% for Glide Slope. "-4" provides 90 Hz ant 20% for LOC and 40% for Glide Slope.

For VOR the selector switch provides -40 to +40 degree bearings in 10 degree steps referred to the nominal bearings selected by the FUNCTION switch.

For MB the selector switch provides 400,1300, 3000 and 1020 Hz CW modulation at 95%. Center position is OFF and negative number selection provides a pulsed modulation.

For COMM the selector switch provides the same signals as for MB but at 30% modulation.

For TX the display is deactivated.

POWER CONSIDERATIONS

The unit contains two five cell NiCad batteries which can power the unit for more than two hours. Even when the unit is operated with the charger activated the batteries will charge. Full battery charge can be obtained in six hours. The unit can be operated when any 12 volt external source such as a car battery is connected.

To indicate a low battery condition the MODULATION display will flash.

OUTPUT SIGNALS

The 2210 has four output signals: Radiated Signal, RF, DMD and PHN.

For the radiated signal, the antenna should be extended to its maximum length. The signal strength should be adequate to test at distances greater than 100 feet.

The RF output provides a sample of the radiated signal at approximately -20 dbm.

The DMD output provides the modulating signal at the following levels:

LOC and GS: 1.25 V P-P
 VOR: 2.0 V P-P
 MB: 3.17 V P-P
 COMM: 1.0 V P-P

The load on this output should be greater than 10 Kohm.

The PHN provides a sample of the Transmitter modulation when the unit is operated in the TX mode.

III. FUNCTIONAL DESCRIPTION

The unit contains three functional units: Modulation Circuits, RF Circuits and Power Supply.

The Modulation Circuits are comprised of four basic functional units:

Display Circuits are controlled by U1 and provide signals to drive LED displays.

9960 Gen is contained in U2 and digitally generates the 9960 Hz subcarrier with the 30Hz modulation.

Tone Gen. is comprised of U4, U5, U6, U8 and associated components.

Phase Delay and Level Set is comprised of U3 and U7

The RF Circuits include the GS and VHF generators. Each generator is driven by a frequency synthesizer chip to obtain the desired output frequency. U1 generates the properly formatted signal to program the frequency synthesizer chip.

Q2 is the VHF oscillator. Q11 and Q9 are buffer amplifiers which isolate the amplitude modulators D10 and D11. Q10 is the output amplifier. D1 detects the RF output level and compares it in U6 with the modulation signal to control the amplitude modulator.

Q1 is the GS oscillator. The circuit functions of the associated circuitry is similar to the VHF circuits.

The TX circuits are comprised of Q8 as an amplifier, D5 as a detector U6A as a phone amplifier, and U6D as an agc amplifier.

The outputs of the GS and VHF generators are combined through a high pass filter and a low pass filter respectively and connected to the antenna.

IV. ALIGNMENT

TEST EQUIPMENT REQUIRED

Oscilloscope: TEK – TDS210 or equivalent
 Multi-meter: FLUKE 75 or equivalent
 Spectrum Analyzer: TEK2712 or equivalent
 NAV-COM: TKM - MX170B or equivalent
 NAV Converter: TKM – MC60 or equivalent

MODULATION CIRCUITS The modulation circuits require alignment to provide low distortion on the modulation signals. The LOC centering and VOR zeroing adjustments are located on the modulation board but are described in the calibration section.

PROCEDURE

1. Monitor the modulation signal on the DMD output. Select LOC function and “-4” on the MODULATION SELECT. Adjust R32 to obtain minimum distortion on the 90 Hz signal. Select “4” on the MODULATION SELECT and adjust R33 to obtain minimum distortion.
2. Monitor the 9960 signal on Pin 1 of U5. Select any VOR function and any MODULATION SELECT POSITION. Adjust R34 for maximum 9960 level. Monitor the DMD output and adjust R35 for equal amplitudes of the 9960 and 30 Hz signals.

RF CIRCUITS The RF circuits require alignment to assure that the oscillators can operate over the desired frequency range.

PROCEDURE

1. Monitor either end of R6 . Select GS function and adjust the winding spacing of L16 to obtain a voltage of 2.5 +/- .5 vdc.
2. Monitor either end of R9. Select LOC function and adjust the winding spacing of L21 to obtain a voltage of 2.8 +/- .1 vdc. Select MB and verify a reading of .20 vdc minimum. Make a small adjustment of L21 if necessary. Select COMM and verify a reading of 4.7 vdc maximum.

RF level and modulation level are described in the calibration section.

V. CALIBRATION

The following calibration procedure assumes that the preceding alignment procedure has been completed. The antenna should be fully extended for this procedure.

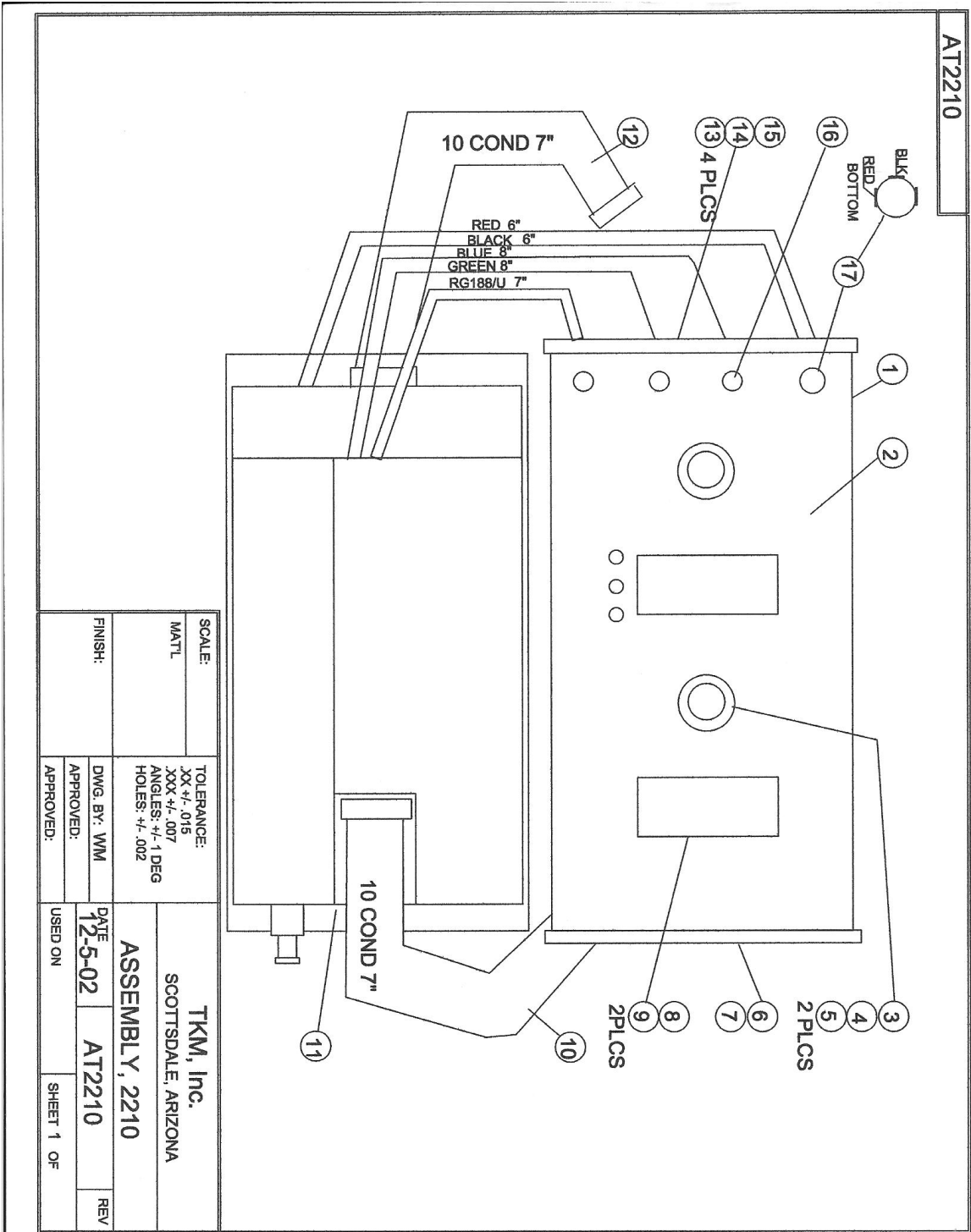
1. Monitor the RF output with spectrum analyzer in the linear detection mode. Select GS function and “4” in MODULATION SELECT. Set R86 for maximum RF level and set the analyzer to 334.7 MHz. Adjust analyzer for full scale reading. Adjust R86 for midscale reading in linear mode and adjust R38 to obtain 40% modulation. Carrier level should be -26 ± 4 dbm.
2. Monitor the RF output as before but at 108.1 MHz. Select LOC function and “4” in MODULATION SELECT. Adjust R43 for maximum RF output and adjust analyzer for full scale reading in linear mode. Adjust R43 for midscale reading and R37 for 20 % modulation. Carrier level should be -20 ± 4 dbm.
3. Monitor the LOC signal on a calibrated NAV COMM receiver with a calibrated CDI. With MODULATION SELECT AT “0” Adjust R41 on the MODULATION Board for a centered needle.
4. Monitor the VOR signal as above and adjust R40 for a centered needle with the OBS set to zero. The FUNCTION should be set to VOR-0.

VI. HARDWARE DESCRIPTION

The following information includes assembly descriptions, schematics and parts list. For access to the inner components remove the four screws on each side of the case. For access to the batteries remove the four screws holding the RF board. Antenna removal can be accomplished by removing the screw at the base of the antenna and sliding the antenna out of the top.

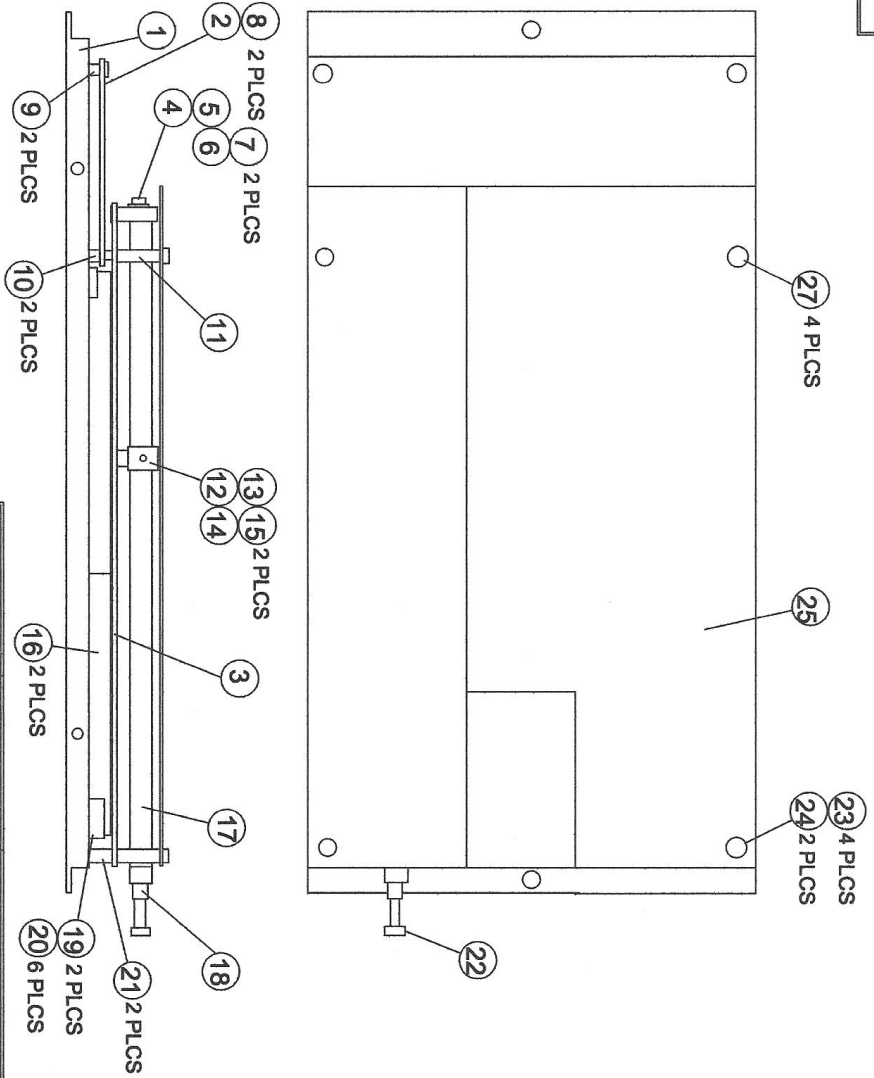
WARRANTY: 2 Years from date of purchase.

VII. Layouts, Schematics, and Parts Lists



NC2210		AT2210-0	
Ref#	Part #	Description	Qty
01	SM2210-1	SHEET METAL CASE; 2210	1
02	SS2215-3	SUB-ASSEMBLY MOD CIRCUITS - 2210	1
03	MP1145-	MISC. PARTS KNOB CAP 14.5 mm	2
04	MP1147-	MISC. PARTS KNOB, POINTER, 14.5mm	2
05	MP1148-	MISC. PARTS NUT COVER, POINTER, 14.5mm	2
06	SM2224-	SHEET METAL PLATE, END	1
07	SM2221-	SHEET METAL PLATE BACKUP (2210)	1
08	HM3080-	HARDWARE; MACHINE Bezel, 3300	9
09	PL2210-	PLASTIC VYNL, ORN, 1.53 X .63	2
10	CA1407-	CABLE; RIBBON 14 COND. X 7"	1
11	SS2222-	SUB-ASSEMBLY RF/PS (2210)	1
12	CA1007-	CABLE; RIBBON 10 COND, X 7"	1
13	NB406F-	FASTENERS 4-40 x 3/8 Phil Flat-100	4
14	SM2204-1	SHEET METAL PLATE, END	1
15	SM2220-	SHEET METAL PLATE, BACKUP	1
16	MP2201-	MISC. PARTS NAMEPLATE; MX11	1
17	EC2020-	CONNECTOR PHONO JACK	3

SS22222

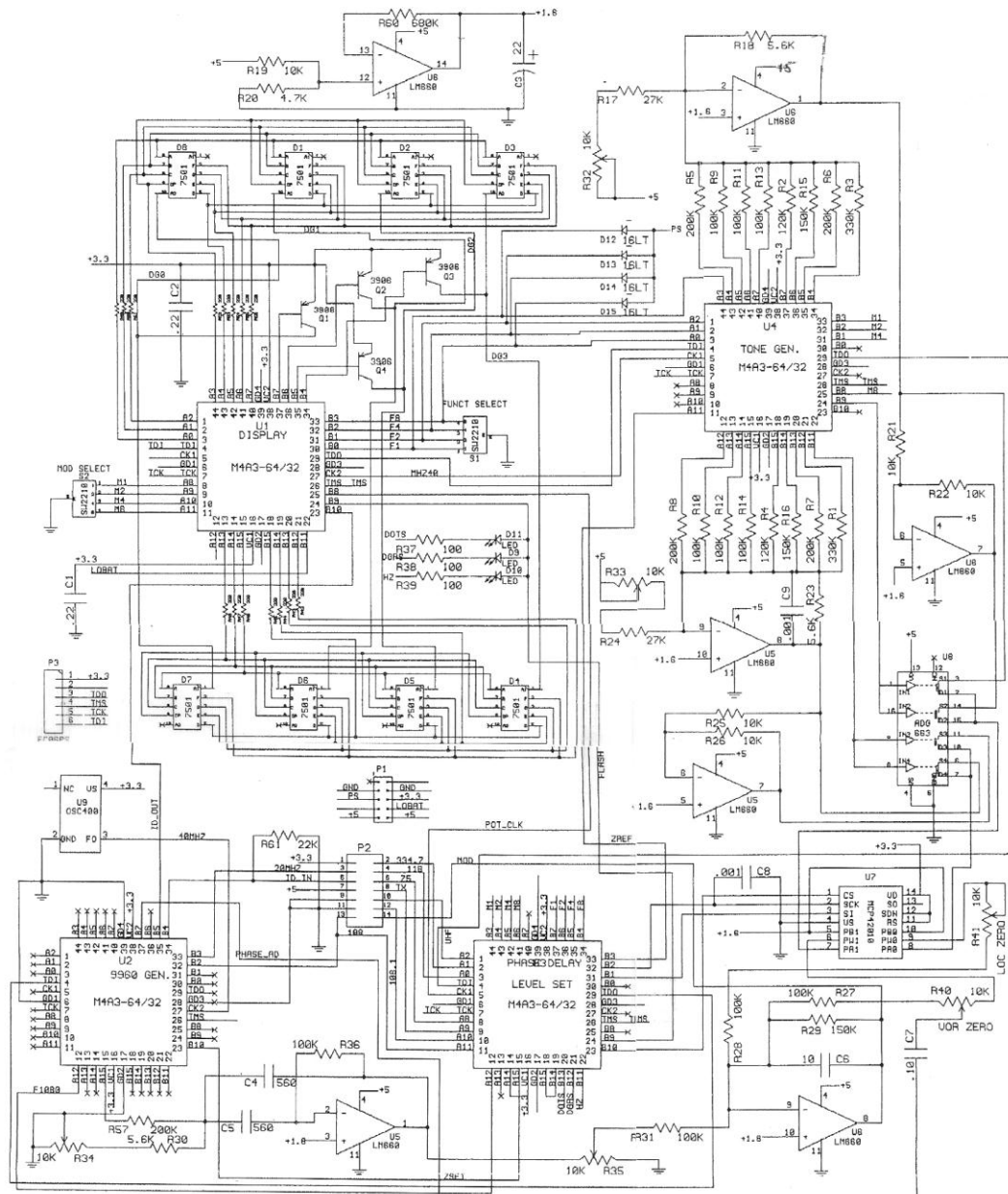


SCALE:	TOLERANCE:	TKM, Inc. SCOTTSDALE, ARIZONA
MAT'L	XX +/- .015	
FINISH:	XXX +/- .007	
	ANGLES: +/- 1 DEG	ASSEMBLY, RF/PS
	HOLES: +/- .002	
DWG. BY: WM	DATE: 2-4-02	SS22222
APPROVED:	USED ON	REV
APPROVED:	SHEET 1 OF	

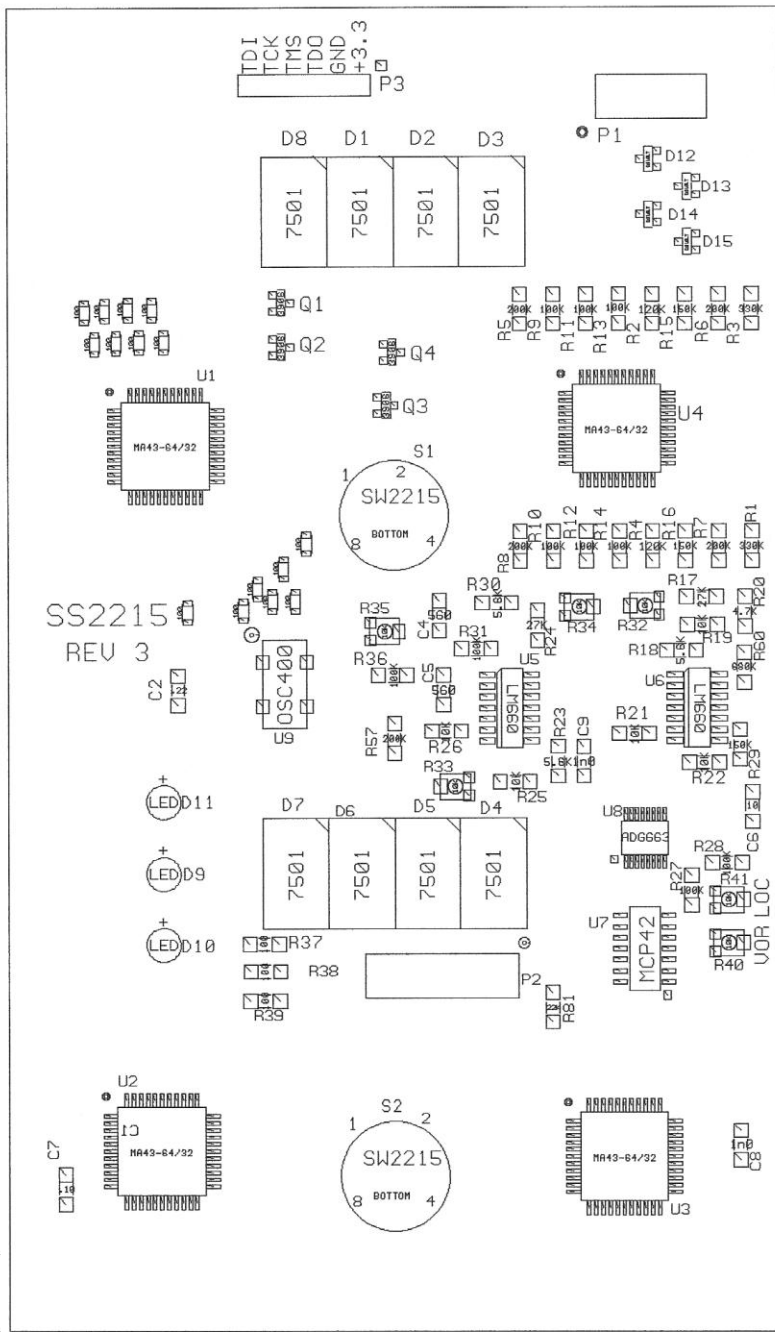
RF/PS; 2210

SS2222-3

Ref#	Part #	Description	Qty
01	SM2212-	SHEET METAL REAR PANEL; 2210	1
02	SS3310-	SUB-ASSEMBLY ASSEMBLY, PS	1
03	SS2220-1	SUB-ASSEMBLY RF CIRCUITS - 2210	1
04	HM2218-	HARDWARE; MACHINE SUPPORT, ANTENNA	1
05	NB405P-	FASTENERS 4-40x5/16 PP SS	1
06	NB1488-	FASTENERS #4 SOLDER LUG	1
07	NB404F-	FASTENERS 4-40x1/4 P100 SS	2
08	NB403P-	FASTENERS 4-40x3/16 PP SS	2
09	HS2224-	SPACER .187 HEX X .42; 4-40	2
10	HS2221-	SPACER HS1815 CUT TO .51	2
11	HS2222-	SPACER .187 HEX X .80; 4-40	2
12	HM2216-	HARDWARE; MACHINE MTG BLOCK, ANT	1
13	NB402A-	FASTENERS 2-56x1/8 ASET PNT SS	1
14	HS1010-	SPACER 3/16 HEX x .187; THRU	2
15	NB407F-	FASTENERS 4-40x7/16 P100 SS	2
16	BA3300-	BATTERY 6V Nicad (5 AA) 800 mah.	2
17	HM2240-	HARDWARE; MACHINE .437 RD. TUBE X 5.12	1
18	PL2202-	PLASTIC ANTENNA INSULATOR	1
19	SM3303-	SHEET METAL HOLDER, BATT	2
20	NB404F-	FASTENERS 4-40x1/4 P100 SS	6
21	HS2205-	SPACER 3/16 HEX x 9/16; 4-40 THD	2
22	MP2202-	MISC. PARTS ANTENNA; VHF	1
23	NB408A-	FASTENERS 4-40x1/2 ASET SS	4
24	HS2223-	SPACER .187 HEX X .375; 4-40	2
25	SM2240-	SHEET METAL SHIELD; RF	1
26	MP2210-	MISC. PARTS NAMEPLATE 2210	1
27	NB404P-	FASTENERS 4-40x1/4 PP SS	4



MODULATION CIRCUITS SS2215 REV 3



MOD GEN - 2210

SS2215-3

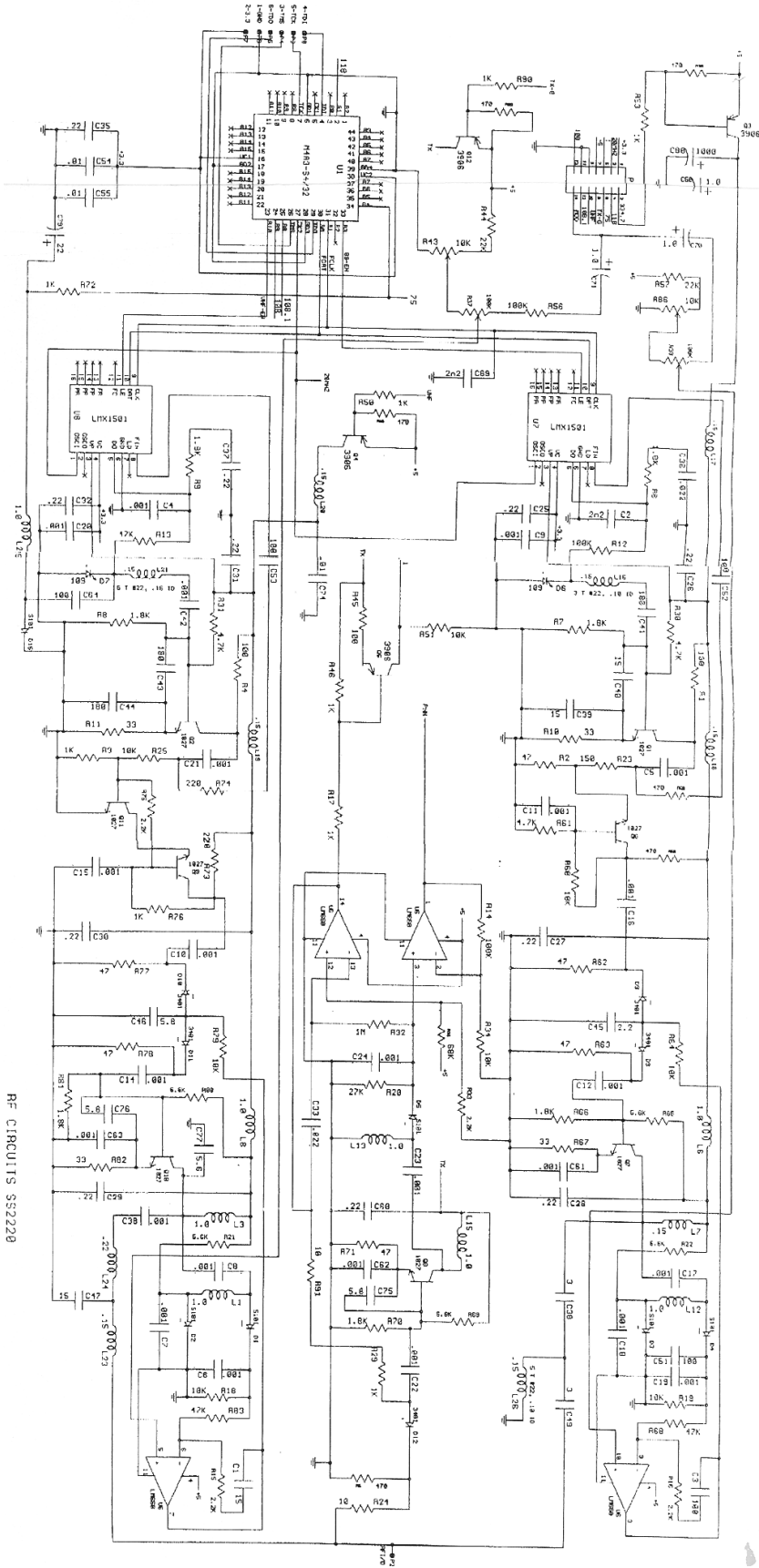
Ref#	Part #	Description	Qty
1	PC2215-3	PCB BOARD; MODULATION	1
C1	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C2	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C4	CS0561-	CAP; SMT; CER; 560 PF 1206	1
C5	CS0561-	CAP; SMT; CER; 560 PF 1206	1
C6	CS0100-	CAP; SMT; CER; 10 PF, 1206	1
C7	CS0104-	CAP; SMT; CER; .1 UF 1206	1
C8	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C9	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
D1	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D10	DDSLED-	DIODE LED, RED	1
D11	DDSLED-	DIODE LED, RED	1
D12	DS0016-	DIODE; SMT SWITCHING	1
D13	DS0016-	DIODE; SMT SWITCHING	1
D14	DS0016-	DIODE; SMT SWITCHING	1
D15	DS0016-	DIODE; SMT SWITCHING	1
D2	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D3	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D4	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D5	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D6	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D7	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D8	DL7501-	OPTICAL RED; 7 SEGMENT LED	1
D9	DDSLED-	DIODE LED, RED	1
P1	ECGP10-	CONNECTOR 10 PIN BOARD PLUG	1
P2	ECGP14-	CONNECTOR 14 PIN Board Plug	1
P3	EC06PS-	CONNECTOR	1
Q1	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
Q2	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
Q3	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
Q4	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
R1	RS0334-	RES; SMT; FILM; 330K, 1/4 W, 1206	1
R10	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R11	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R12	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R13	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R14	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R15	RS0154-	RES; SMT; FILM; 150K ; 5%; 1206	1
R16	RS0154-	RES; SMT; FILM; 150K ; 5%; 1206	1
R17	RS0273-	RES; SMT; FILM; 27K; 1/4W 5%; 1206	1
R18	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R19	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R2	RS0124-	RES; SMT; FILM; 120 Kohm, 5%, 1206	1
R20	RS0472-	RES; SMT; FILM; 4.7K; 1/4W 5%; 1206	1
R21	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R22	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R23	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R24	RS0273-	RES; SMT; FILM; 27K; 1/4W 5%; 1206	1
R25	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R26	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1

MOD GEN - 2210

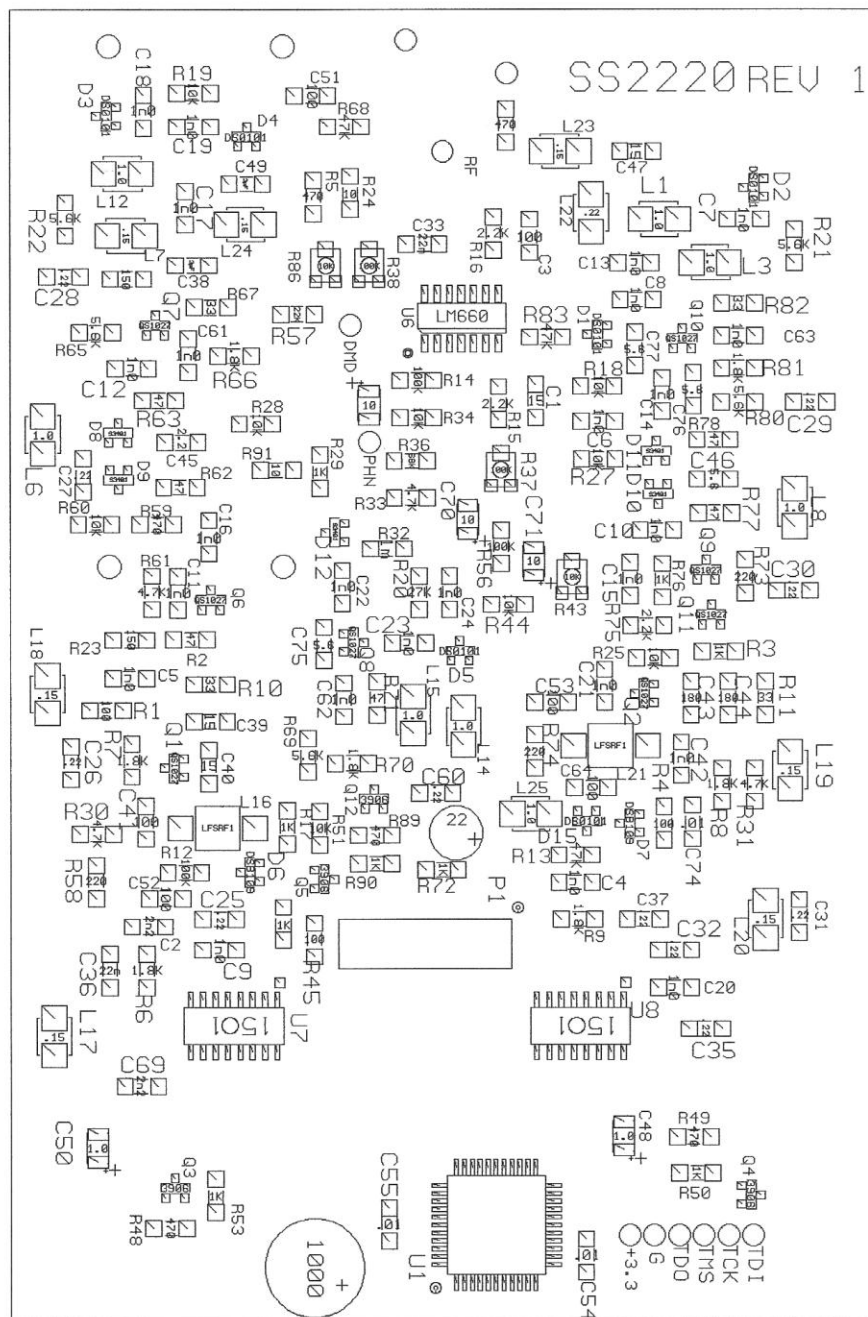
SS2215-3

Ref#	Part #	Description	Qty
R27	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R28	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R29	RS0154-	RES; SMT; FILM; 150K ; 5%; 1206	1
R3	RS0334-	RES; SMT; FILM; 330K, 1/4 W, 1206	1
R30	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R31	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R32	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R33	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R34	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R35	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R36	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
R37	RS0101-	RES; SMT; FILM; 100 OHM;1/4W 5%; 1206	1
R38	RS0101-	RES; SMT; FILM; 100 OHM;1/4W 5%; 1206	1
R39	RS0101-	RES; SMT; FILM; 100 OHM;1/4W 5%; 1206	1
R4	RS0124-	RES; SMT; FILM; 120 Kohm, 5%, 1206	1
R40	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R41	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R42	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R43	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R44	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R45	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R46	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R47	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R48	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R49	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R5	RS0204-	RES; SMT; FILM; 200K, 1206, 1/4 W	1
R50	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R51	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R52	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R53	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R54	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R55	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R56	RS6221-	RES; SMT; FILM; 220 Ohm; 603	1
R57	RS0204-	RES; SMT; FILM; 200K, 1206, 1/4 W	1
R6	RS0204-	RES; SMT; FILM; 200K, 1206, 1/4 W	1
R60	RS0684-	RES; SMT; FILM; 680K; 1/4W 5%; 1206	1
R61	RS0223-	RES; SMT; FILM; 22K, 5%, 1206	1
R7	RS0204-	RES; SMT; FILM; 200K, 1206, 1/4 W	1
R8	RS0204-	RES; SMT; FILM; 200K, 1206, 1/4 W	1
R9	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%;1206	1
S1	SW2210-	SWITCHES 16 POS BCD PC MOUNT	1
S2	SW2210-	SWITCHES 16 POS BCD PC MOUNT	1
U1	ISM364-	INT. CKT.; SMT M4A3-64/32-10VC	1
U2	ISM364-	INT. CKT.; SMT M4A3-64/32-10VC	1
U3	ISM364-	INT. CKT.; SMT M4A3-64/32-10VC	1
U4	ISM364-	INT. CKT.; SMT M4A3-64/32-10VC	1
U5	IS0660-	INT. CKT.; SMT LM660 QUAD OP AMP	1
U6	IS0660-	INT. CKT.; SMT LM660 QUAD OP AMP	1
U7	ISCP42-	INT. CKT.; SMT DUAL DIGITAL POT	1
U8	ISG663-	INT. CKT.; SMT Quad Analog Switch	1

		MOD GEN - 2210	SS2215-3	
Ref#	Part #	Description	Qty	
U9	OSC400-	OSCILLATOR 40 MHz SOT	1	



RF CIRCUITS SS2228



RF CIRCUITS

SS2220-4

Ref#	Part #	Description	Qty
C1	CS0150-	CAP; SMT; CER; 15pf; 100V; 1206	1
C10	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C11	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C12	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C14	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C15	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C16	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C17	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C18	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C19	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C2	CS0222-	CAP; SMT; CER; 2200 PF, X7R, 10%, 1206	1
C20	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C21	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C22	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C23	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C24	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C25	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C26	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C27	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C28	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C29	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C3	CS0101-	CAP; SMT; CER; 100PF; 100V; 1206	1
C30	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C31	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C32	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C33	CS0223-	CAP; SMT; CER; .022 UF, X7R, 10%, 1206	1
C35	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C36	CS0223-	CAP; SMT; CER; .022 UF, X7R, 10%, 1206	1
C37	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C38	CS03R0-	CAP; SMT; CER; 3.0 pF, 10%, 1206	1
C38	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C39	CS0150-	CAP; SMT; CER; 15pf; 100V; 1206	1
C4	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C40	CS0150-	CAP; SMT; CER; 15pf; 100V; 1206	1
C41	CS0181-	CAP; SMT; CER; 180PF; 100V; 1206	1
C42	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C43	CS0181-	CAP; SMT; CER; 180PF; 100V; 1206	1
C44	CS0181-	CAP; SMT; CER; 180PF; 100V; 1206	1
C45	CS02R2-	CAP; SMT; CER; 2.2 PF, NPO, 5%, 1206	1
C46	CS05R6-	CAP; SMT; CER; 5.6pF; 100V; 1206	1
C47	CS0150-	CAP; SMT; CER; 15pf; 100V; 1206	1
C49	CS03R0-	CAP; SMT; CER; 3.0 pF, 10%, 1206	1
C5	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C50	CX0105-	CAP; SMT; TANT 1.0 uF; 35 V	1
C51	CS0101-	CAP; SMT; CER; 100PF; 100V; 1206	1
C52	CS0101-	CAP; SMT; CER; 100PF; 100V; 1206	1
C53	CS0101-	CAP; SMT; CER; 100PF; 100V; 1206	1
C54	CS0103-	CAP; SMT; CER; .01 uF; 100V; 1206	1
C55	CS0103-	CAP; SMT; CER; .01 uF; 100V; 1206	1
C6	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1

RF CIRCUITS

SS2220-4

Ref#	Part #	Description	Qty
C60	CS0224-	CAP; SMT; CER; .22 uF; 50 V; 1206 case	1
C61	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C62	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C63	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C64	CS0101-	CAP; SMT; CER; 100PF; 100V; 1206	1
C69	CS0222-	CAP; SMT; CER; 2200 PF, X7R, 10%, 1206	1
C7	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C70	CX0105-	CAP; SMT; TANT 1.0 uF; 35 V	1
C71	CX0105-	CAP; SMT; TANT 1.0 uF; 35 V	1
C74	CS0103-	CAP; SMT; CER; .01 uF; 100V; 1206	1
C75	CS05R6-	CAP; SMT; CER; 5.6pF; 100V; 1206	1
C76	CS05R6-	CAP; SMT; CER; 5.6pF; 100V; 1206	1
C77	CS05R6-	CAP; SMT; CER; 5.6pF; 100V; 1206	1
C79	CE2263-	CAP; ALUM ELECT. 22 uF, 35 V, LOW	1
C8	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
C80	CE1081-	CAP; ALUM ELECT. 1000/6.3-10V; RADIAL	1
C9	CS0102-	CAP; SMT; CER; .001 uF; 100V; 1206	1
D1	DS0101-	DIODE; SMT MMBD101	1
D10	DS3401-	DIODE; SMT MMBV3401	1
D11	DS3401-	DIODE; SMT MMBV3401	1
D12	DS3401-	DIODE; SMT MMBV3401	1
D15	DS0101-	DIODE; SMT MMBD101	1
D2	DS0101-	DIODE; SMT MMBD101	1
D3	DS0101-	DIODE; SMT MMBD101	1
D4	DS0101-	DIODE; SMT MMBD101	1
D5	DS0101-	DIODE; SMT MMBD101	1
D6	DS0109-	DIODE; SMT MMBV109	1
D7	DS0109-	DIODE; SMT MMBV109	1
D8	DS3401-	DIODE; SMT MMBV3401	1
D9	DS3401-	DIODE; SMT MMBV3401	1
L1	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
L12	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
L13	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
L15	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
L16	LS0154-	IND; FIXED; SMT .15 uH; 10% SMT	1
L17	LS0154-	IND; FIXED; SMT .15 uH; 10% SMT	1
L18	LS0154-	IND; FIXED; SMT .15 uH; 10% SMT	1
L19	LS0154-	IND; FIXED; SMT .15 uH; 10% SMT	1
L20	LS0154-	IND; FIXED; SMT .15 uH; 10% SMT	1
L21	LS0154-	IND; FIXED; SMT .15 uH; 10% SMT	1
L23	LS0R15-	IND; FIXED; SMT .15 UH, 1210, 10%	1
L24	LS0R22-	IND; FIXED; SMT .22 UH, 1210, 10%	1
L25	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
L26	LS0R15-	IND; FIXED; SMT .15 UH, 1210, 10%	1
L3	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
L6	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
L7	LS0R15-	IND; FIXED; SMT .15 UH, 1210, 10%	1
L8	LS01R0-	IND; FIXED; SMT 1.0 UH, 1210, 10%	1
Q1	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1
Q10	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1

RF CIRCUITS

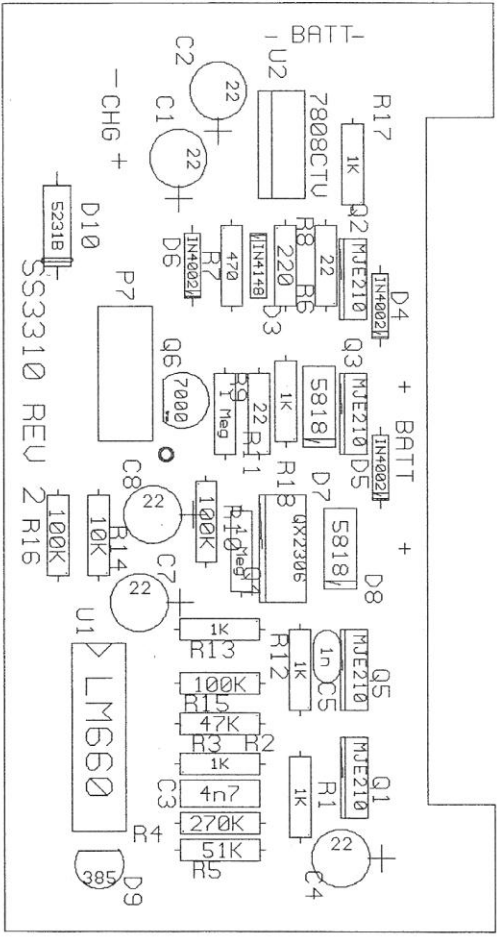
SS2220-4

Ref#	Part #	Description	Qty
Q11	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1
Q12	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
Q2	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1
Q3	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
Q4	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
Q5	QS3906-	TRANSISTOR; SMT PNP 2N3906	1
Q6	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1
Q7	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1
Q8	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1
Q9	QS1027-	TRANSISTOR; SMT NPN RF Amp; MRF1027T1	1
R1	RS0101-	RES; SMT; FILM; 100 OHM; 1/4W 5%; 1206	1
R10	RS0330-	RES; SMT; FILM; 33 OHM; 5%; 1206	1
R11	RS0330-	RES; SMT; FILM; 33 OHM; 5%; 1206	1
R12	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%; 1206	1
R13	RS0473-	RES; SMT; FILM; 47K; 1/4W 5%; 1206	1
R14	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%; 1206	1
R15	RS0222-	RES; SMT; FILM; 2.2K; 5%; 1206	1
R16	RS0222-	RES; SMT; FILM; 2.2K; 5%; 1206	1
R17	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R18	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R19	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R2	RS0470-	RES; SMT; FILM; 47 ohm, 1206, 5%	1
R20	RS0273-	RES; SMT; FILM; 27K; 1/4W 5%; 1206	1
R21	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R22	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R23	RS0151-	RES; SMT; FILM; 150 OHM; 5%; 1206	1
R24	RS0100-	RES; SMT; FILM; 10 OHM; 5%; 1206	1
R25	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R29	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R3	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R30	RS0472-	RES; SMT; FILM; 4.7K; 1/4W 5%; 1206	1
R31	RS0472-	RES; SMT; FILM; 4.7K; 1/4W 5%; 1206	1
R32	RS0105-	RES; SMT; FILM; 1 MEG; 1/4W 5%; 1206	1
R33	RS0222-	RES; SMT; FILM; 2.2K; 5%; 1206	1
R34	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R36	RS0683-	RES; SMT; FILM; 68K; 1/4W 5%; 1206	1
R37	PS0104-	POT; SMT; 100K, 20%	1
R38	PS0104-	POT; SMT; 100K, 20%	1
R4	RS0101-	RES; SMT; FILM; 100 OHM; 1/4W 5%; 1206	1
R43	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R44	RS0223-	RES; SMT; FILM; 22K, 5%, 1206	1
R45	RS0101-	RES; SMT; FILM; 100 OHM; 1/4W 5%; 1206	1
R46	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R48	RS0471-	RES; SMT; FILM; 470 OHM; 1/4W 5%; 1206	1
R49	RS0471-	RES; SMT; FILM; 470 OHM; 1/4W 5%; 1206	1
R5	RS0471-	RES; SMT; FILM; 470 OHM; 1/4W 5%; 1206	1
R50	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R51	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R53	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R56	RS0104-	RES; SMT; FILM; 100K; 1/4W 5%; 1206	1

RF CIRCUITS

SS2220-4

Ref#	Part #	Description	Qty
R57	RS0223-	RES; SMT; FILM; 22K, 5%, 1206	1
R58	RS0471-	RES; SMT; FILM; 470 OHM; 1/4W 5%; 1206	1
R59	RS0471-	RES; SMT; FILM; 470 OHM; 1/4W 5%; 1206	1
R6	RS0182-	RES; SMT; FILM; 1.8K; 1/4W 5%; 1206	1
R60	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R61	RS0472-	RES; SMT; FILM; 4.7K; 1/4W 5%; 1206	1
R62	RS0470-	RES; SMT; FILM; 47 ohm,1206, 5%	1
R63	RS0470-	RES; SMT; FILM; 47 ohm,1206, 5%	1
R64	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R65	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R66	RS0182-	RES; SMT; FILM; 1.8K; 1/4W 5%; 1206	1
R67	RS0330-	RES; SMT; FILM; 33 OHM; 5%; 1206	1
R68	RS0473-	RES; SMT; FILM; 47K; 1/4W 5%; 1206	1
R69	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R7	RS0182-	RES; SMT; FILM; 1.8K; 1/4W 5%; 1206	1
R70	RS0182-	RES; SMT; FILM; 1.8K; 1/4W 5%; 1206	1
R71	RS0470-	RES; SMT; FILM; 47 ohm,1206, 5%	1
R72	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R73	RS0221-	RES; SMT; FILM; 220 OHM; 1/4W 5%;1206	1
R74	RS0221-	RES; SMT; FILM; 220 OHM; 1/4W 5%;1206	1
R75	RS0222-	RES; SMT; FILM; 2.2K; 5%; 1206	1
R76	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R77	RS0470-	RES; SMT; FILM; 47 ohm,1206, 5%	1
R78	RS0470-	RES; SMT; FILM; 47 ohm,1206, 5%	1
R79	RS0103-	RES; SMT; FILM; 10K; 1/4W 5%; 1206	1
R8	RS0182-	RES; SMT; FILM; 1.8K; 1/4W 5%; 1206	1
R80	RS0562-	RES; SMT; FILM; 5.6K; 5%; 1206	1
R81	RS0182-	RES; SMT; FILM; 1.8K; 1/4W 5%; 1206	1
R82	RS0330-	RES; SMT; FILM; 33 OHM; 5%; 1206	1
R83	RS0473-	RES; SMT; FILM; 47K; 1/4W 5%; 1206	1
R86	PS0103-	POT; SMT; 10 Kohm, 3 mm.	1
R89	RS0471-	RES; SMT; FILM; 470 OHM; 1/4W 5%; 1206	1
R9	RS0182-	RES; SMT; FILM; 1.8K; 1/4W 5%; 1206	1
R90	RS0102-	RES; SMT; FILM; 1K; 1/4W 5%; 1206	1
R91	RS0100-	RES; SMT; FILM; 10 OHM; 5%; 1206	1
U1	ISM364-	INT. CKT.; SMT M4A3-64/32-10VC	1
U6	IS0660-	INT. CKT.; SMT LM660 QUAD OP AMP	1
U6	IS0660-	INT. CKT.; SMT LM660 QUAD OP AMP	1
U6	IS0660-	INT. CKT.; SMT LM660 QUAD OP AMP	1
U6	IS0660-	INT. CKT.; SMT LM660 QUAD OP AMP	1
U7	IS1501-	INT. CKT.; SMT FREQ. SYNTH	1
U8	IS1501-	INT. CKT.; SMT FREQ. SYNTH	1



POWER SUPPLY
SS3310 REV 2

POWER SUPPLY, 3300

SS3310-3

Ref#	Part #	Description	Qty
C1	CE2263-	CAP; ALUM ELECT. 22 uF, 35 V, LOW	1
C2	CE2263-	CAP; ALUM ELECT. 22 uF, 35 V, LOW	1
C3	CR1034-	CAP; MONO-CERAMIC .01; 50V AXIAL	1
C4	CE2263-	CAP; ALUM ELECT. 22 uF, 35 V, LOW	1
C5	CR1024-	CAP; MONO-CERAMIC .001uF; 100V	1
C7	CE2263-	CAP; ALUM ELECT. 22 uF, 35 V, LOW	1
C8	CE2263-	CAP; ALUM ELECT. 22 uF, 35 V, LOW	1
C9	CR1034-	CAP; MONO-CERAMIC .01; 50V AXIAL	1
D10	DD5231-	DIODE ZENER; 1N5231	1
D3	DD4148-	DIODE 1N4148	1
D4	DD4002-	DIODE 1N4002	1
D5	DD4002-	DIODE 1N4002	1
D6	DD4002-	DIODE 1N4002	1
D7	DD5819-	DIODE 1N5819	1
D8	DD5819-	DIODE 1N5819	1
D9	DD0385-	DIODE REFERENCE 2.5V	1
P7	ECGP10-	CONNECTOR 10 PIN BOARD PLUG	1
Q1	QX0210-	TRANSISTOR MJE210	1
Q2	QX0210-	TRANSISTOR MJE210	1
Q3	QX0210-	TRANSISTOR MJE210	1
Q4	QX2306-	TRANSISTOR 23P06	1
Q5	QX0210-	TRANSISTOR MJE210	1
Q6	QX7000-	TRANSISTOR 2N7000	1
R1	RC0102-	RESISTOR; CARB. 1 Kohm; 5%; 1/4 watt	1
R10	RC0104-	RESISTOR; CARB. 100K 5% 1/4W	1
R11	RC0105-	RESISTOR; CARB. 1 Megohm; 5%; 1/4 watt	1
R12	RC0102-	RESISTOR; CARB. 1 Kohm; 5%; 1/4 watt	1
R13	RC0102-	RESISTOR; CARB. 1 Kohm; 5%; 1/4 watt	1
R14	RC0103-	RESISTOR; CARB. 10 Kohm; 5%; 1/4 watt	1
R15	RC0104-	RESISTOR; CARB. 100K 5% 1/4W	1
R16	RC0104-	RESISTOR; CARB. 100K 5% 1/4W	1
R17	RC0102-	RESISTOR; CARB. 1 Kohm; 5%; 1/4 watt	1
R18	RC0102-	RESISTOR; CARB. 1 Kohm; 5%; 1/4 watt	1
R19	RC0105-	RESISTOR; CARB. 1 Megohm; 5%; 1/4 watt	1
R2	RC0102-	RESISTOR; CARB. 1 Kohm; 5%; 1/4 watt	1
R20	RC0182-	RESISTOR; CARB. 1.8 Kohm; 5%; 1/4 watt	1
R21	RC0182-	RESISTOR; CARB. 1.8 Kohm; 5%; 1/4 watt	1
R3	RC0473-	RESISTOR; CARB. 47 Kohm; 5%; 1/4 watt	1
R4	RC0184-	RESISTOR; CARB. 180K 1/4W 5%	1
R5	RC0513-	RESISTOR; CARB. 51K; 1/4W;5%	1
R6	RC0221-	RESISTOR; CARB. 220 Ohm; 5%; 1/4 watt	1
R7	RC0471-	RESISTOR; CARB. 470 Ohm; 5%; 1/4 watt	1
R8	RC0220-	RESISTOR; CARB. 22 Ohm; 5%; 1/4 watt	1
R9	RC0220-	RESISTOR; CARB. 22 Ohm; 5%; 1/4 watt	1
U1	IM0660-	INT. CKT.; MISC. LMC660	1
U1	IM0660-	INT. CKT.; MISC. LMC660	1
U2	IM7808-	INT. CKT.; MISC. REGULATOR; 8V 7808	1