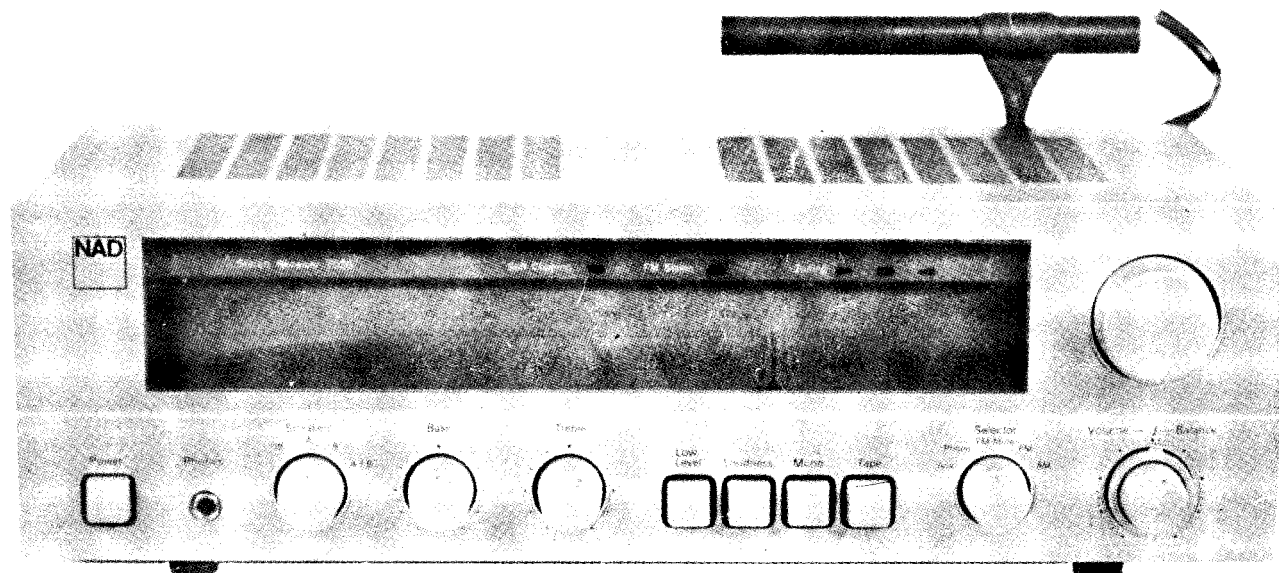


# SERVICE MANUAL

## NAD MODEL 7020

### AM/FM STEREO RECEIVER



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## SPECIFICATION

### FM Tuner Section

Input Sensitivity IHF, 30 dB quieting	1.8 $\mu$ V
IHF, 50 dB S/N Mono/Stereo	3.5 $\mu$ V/45 $\mu$ V
Signal to Noise Ratio(A weighted, at 65 dBf)Mono/Stereo	75dB/70dB
Frequency Response, 30—15K Hz	$\pm$ 0.5dB
De-emphasis Accuracy 75 $\mu$ Sec	$\pm$ 0.5dB
Channel Separation 1K Hz	42dB
30—15K Hz	32dB
Selectivity, Alternate Channel(400KHz)	62dB
Capture Ratio at 45 dBf and 65 dBf	1.5dB
AM Suppression at 45 dBf and 65 dBf	60dB
Image Rejection	50dB
I.F Rejection	75dB
SCA Rejection	70dB
Pilot Signal Suppression	55dB
THD at 100% Modulation 1.KHz Mono/Stereo	0.2%/0.3%
100 Hz Mono/Stereo	0.2%/0.3%
6KHz Mono/Stereo	0.3%/0.4%
THD Stereo 1KHz 50%/150%	0.3%/0.4%

### AM Tuner Section

Usable Sensitivity	350 $\mu$ V
Sensitivity	30dB
Image Rejection	45dB
IF Rejection	40dB

### Audio Section

\* measurements identified by an asterisk are taken in accordance with the new IHF A-202 amplifier measurement standard.

### Power Amplifier Section

* Continuous average power output at 8 ohm 20-20K Hz both channel driven	> 20W
Rated distortion.	< 0.02%
* Clipping headroom at 8 ohm	+ 1.5dB
Clipping power at 8 ohm/4 ohm/2 ohm	28W/37W/42W
Dynamic headroom at 8 ohm	+ 3dB
Dynamic power at 8 ohm /4ohm/2ohm	40W/58W/72W
* Reactive load rating	+ 1.7dB
* Transient Overload Recovery Time	< 1 $\mu$ Sec
* Slew Factor	> 50
Slew Rate	18V/ $\mu$ sec
Damping factor at .50 Hz (Ref. 8 ohm)	> 55
T.H.D 20-20K Hz From 250m V to 20W	< 0.02%
S.M.P.T.E I.M.D(60Hz $\pm$ 7KHz, 4:1)From 250mWto 20W	< 0.02%
I.H.F I.M.D(19K Hz+20K Hz) at 20W	< 0.02%
T.I.M (15K Hz Sine+3.18KHz Square Wave) at 20W	< 0.02%
Frequency Response, 20—20K Hz(From Lab. IN)	$\pm$ 0.5dB
Frequency Response Range $\pm$ 3dB	10—70K Hz

### Preamplifier Section

* Input Impedance Resistance/Capacitance	47K $\Omega$ /100pF
Input Sensitivity(1K Hz) * For 1 Watt out/20 Watt out	0.5mV/2.5mV
Input Overload at 20Hz/1K Hz/20K Hz	27mV/270mV/2V
T.H.D (20—20K Hz)and IMD at + 30dB input level	< 0.02%
RIAA Response Accuracy	$\pm$ 0.5dB
Signal to Noise Ratio A Weighted	
(a)With phono cartridge connected Ref 10mV/* Ref 5mV	80dB/75dB
(b)With short-circuit input Ref 10mV	84dB

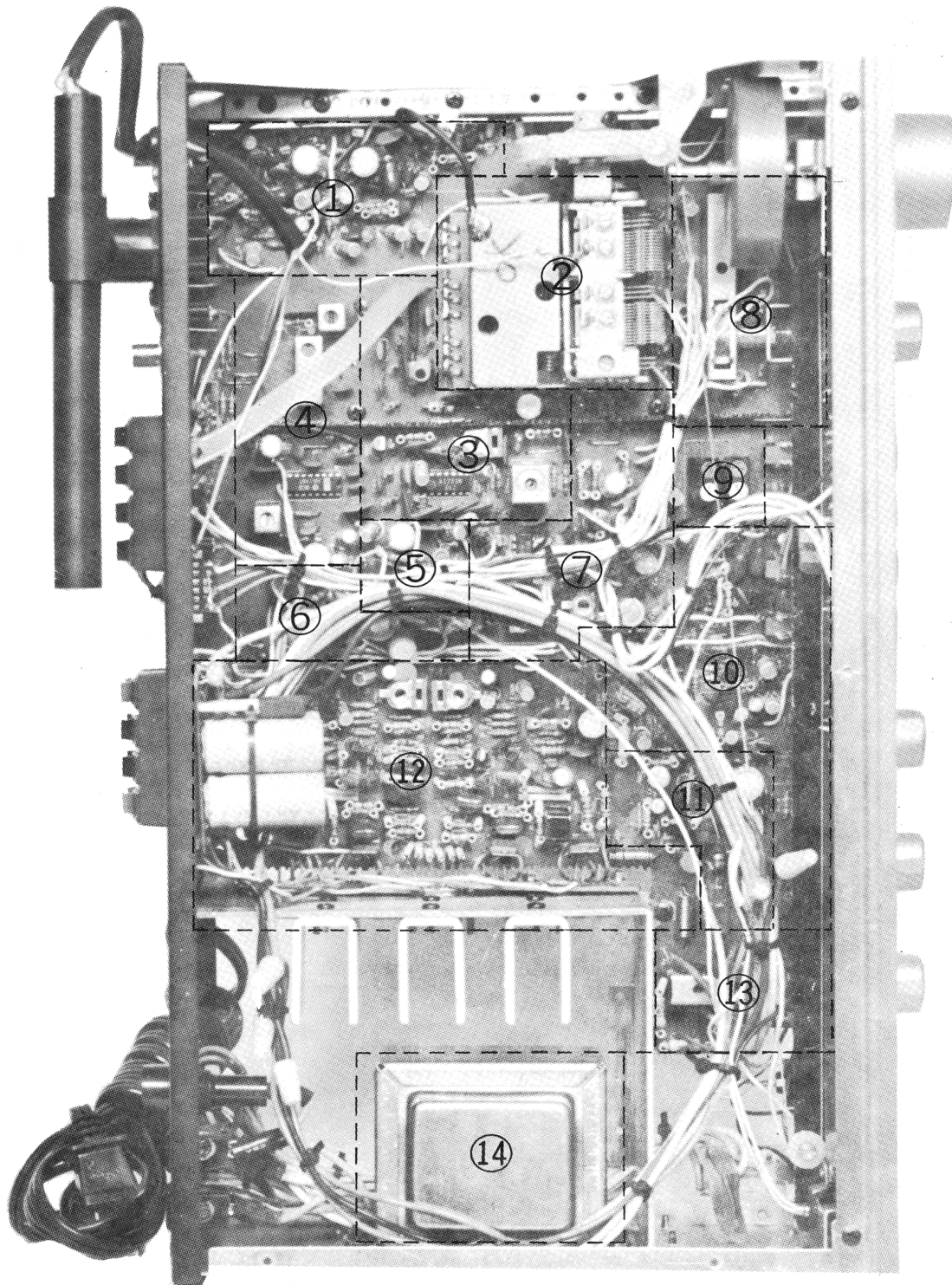
### High Level Input

* Input impedance Resistance/Capacitance	20K $\Omega$ /100pF
Input Sensitivity * For 1 Watt out/For 20 Watt out	30mV/150mV
Signal to Noise Ratio, A—Weighted * Ref 1Watt out	> 80dB
Ref 20 Watt out	> 110dB
* Maximum input signal	Infinite
Frequency Response, 20—20K Hz	$\pm$ 0.5dB

### Controls

Bass control range at 50 Hz	$\pm$ 10dB
Treble control range at 10K Hz	$\pm$ 7dB
Infrasonic filter Turn Over frequency(From Normal 1N)	15Hz
Slope (dB/octave)	12
Power Consumption	150VA
Weight	7.5K g
Dimension Height $\times$ Width $\times$ Depth(mm)	120 $\times$ 420 $\times$ 240

# INSIDE VIEW OF UNIT



①Phono Amp

②FM RF Amp

③FM IF Amp

④AM System

⑤LED Driver

⑥Tuner Regulator

⑦MPX & Buffer

⑧Function Sw

⑨Low Pass Filter

⑩Tone Amp

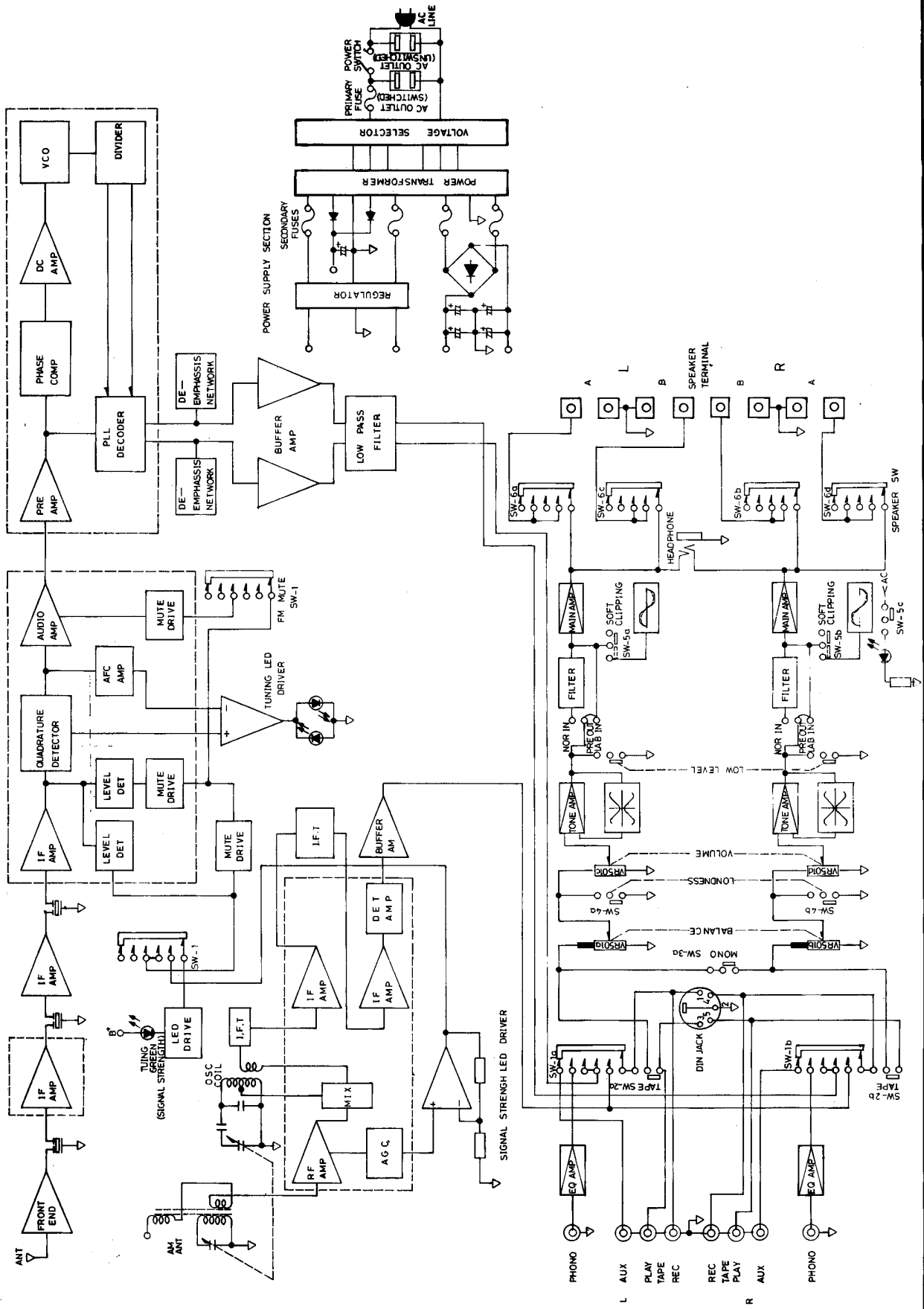
⑪Amp Regulator

⑫Power Amp

⑬Speakers Sw

⑭Power Transformer

# 7020 BLOCK DIAGRAM



## ALIGNMENT (TUNER)

1. AM ALIGNMENT: 1. Selector switch in AM position 2. AC line voltage at rated voltage 3. Monitor output at REC OUT							
Section	AM SG			Dial Setting	Indicator	Adjustment Point	Adjust for
	Connetion	Carrier Freq.	Modulation				
AM IF	Hot side of SG Output through 200 PF to AM antenna trimmer terminal (TPI)		455KHz	30% Mod 400Hz	Point of non-interference	T302 and T303	Maximum output
AM RF	1	Hot side of SG output through 200 PF to EXT AM antenna Terminal on near panel	600KHz	30% Mod. 400Hz	600KHz	VTVM or Oscilloscope	Maximum output
	2		1400KHz	30% Mod. 400Hz	1400KHz		
	3		Repeat Step 1 and Step 2				
2. FM ALIGNMENT: 1. Selector Switch in FM position 2. AC line voltage at rated voltage 3. Monitor output at REC OUT							
Section	FM SG			Dial Setting	Indicator	Adjustment	Adjust for
	Connetion	Carrier Freq.	Modulation				
AM IF	—			Point of non-interference	Tuning Meter of Set	T101 (Discr. IF primary A)	Center Indication
FM RM	1	Connect to FM 300 ohm antenna Terminal on the rear panel through FM dummy antenna.	90MHz	100% Mod. 400Hz	90MHz	VTVM or Oscilloscope	Maximum output
	2		106MHz		106MHz		
	3		Repeat Step 1 and Step 2				
FM Mono Distortion	1	98MHz	100% Mod. 400Hz	98MHz	Distortion Meter*	T101 upper side	Minimum Distortion
	2	Repeat FM IF and FM MONO DISTORTION STEP 1					
FM Mute	1	Selector Switch in FM Muting Position Adjust*attenuator of FM SG for antenna input 15dB					
	2	98MHz	100% Mod 400Hz	98MHz	VTVM or Oscilloscope	VR101	Output just disappear
	3	Increase FM SG output 4dB more to get full audio output					
	4	If full audio output cannot be got repeat step 1. 2. 3.					

3. FM MPX ALIGNMENT 1. Same as FM ALIGNMENT 1. 2. 3. 2. FM SG is external modulated by stereo SG and connected to FM 300 $\Omega$ antenna terminal on the rear panel through FM dummy antenna.									
Section	Step	FM SG	Stereo SG	Dial Setting	Indicator	Adjustment	Adjust for		
MPX pilot	1	—	—	Point of no signal received	Connect frequency counter through 100K $\Omega$ to TP10	VR201	19KHz $\pm$ 30Hz		
	2	98MHz	10% 19KHz Pilot 90% L+R, L-R	98MHz	—	VR201	Stereo LED light		
Separation	1	98MHz	10% 19KHz pilot L only	98MHz	Connect VTVM or Oscilloscope to R REC OUT	VR202	Minimum output		
	2		10% 19KHz pilot R only	98MHz	Connect VTVM or Oscilloscope to L REC OUT	VR202	Minimum output		
	3		Repeat Step 1 and Step 2						
	4		If there is an excessive difference between leak-free effect of both channels slightly adjust VR202 so that the level of signal leakage of both channels are equal						

### ALIGNMENT (AUDIO)

#### **IDLE CURRENT ALIGNMENT**

1. 5 Minutes minimum pre-heating is necessary.
2. Set the volume control at minimum position.
3. Connect DC milli-voltmeter across R660 for right channel and across R659 for left channel. The meter sensitivity should be set for 30–100mV full scale deflection.
4. Insert 1 kohm carbon resistor to connect in parallel with R648(right channel) and R647(left channel).
5. After insert 1Kohm. if the reading of meter were between 30mV and 60mV then the alignment is completed.
6. If the reading were less than 30mV then the value of RX1 or RX2 should be reduced till the reading is between 30mV and 60mV.
7. If the reading were more than 60mV. then the value of RX1 or RX2 should be increase till the reading is between 30mV and 60mV.

#### **DC OFF-SET ALIGNMENT**

1. 5 minutes minimum pre-heating is necessary for DC offset adjustment.
2. Set the volume control at minimum position.
3. Speaker switch should be set to "A" position.
4. Connect a DC milli-voltmeter to the "A speaker" terminals of each channel. The meter sensitivity should be set for 100-300mV full scale deflection. The positive input of the meter should be connected to the red (+) speaker terminal.
5. If the readings are within +50mV, then no adjustment is necessary.
6. If the reading is more than +50mV then adjust VR601 (for left channel) and VR602 (for right channel) till the meter reading is zero.

SYMBOL NO	PARTS NO	DESCRIPTION	REF
C306	17-5D473M	CER CAPA	5.00
C307	17-5D103M	CER CAPA	3.40
C308	17-5D103M	CER CAPA	3.40
C309	17-5D473M	CER CAPA	5.00
C310	17-1.6E107Y	ELEC CAPA	14.00
C311	17-5D102M	CER CAPA	4.00
C312	17-2.5E475Y	ELEC CAPA	8.00
C313	17-5D103M	CER CAPA	3.40
C314	17-1.6E227Y	ELEC CAPA	33.50
C315	17-2.5E475Y	ELEC CAPA	8.00
C316	17-5F183J	MYLAR CAPA	8.90
C317	17-5F152J	MYLAR CAPA	6.50
C318	17-5F183J	MYLAR CAPA	8.90
C319	17-2.5E475Y	ELEC CAPA	8.00
C320	17-2.5E225Y	ELEC CAPA	8.00
C321	17-5D102M	CER CAPA	4.00
C401 C402	17-2.5E475Y	ELEC CAPA	8.00
C403 C404	17-5D101M	CER CAPA	3.50
C405 C406	17-5F 102J	MYLAR CAPA	6.50
C407 C408	17-0.63E 108Y	ELEC C CAPA	32.50
C409 C410	17-5D100D	CER CAPA	3.50
C411 C412	17-5D221M	CER CAPA	4.00
C413 C414	17-0.63E476Y	ELEC CAPA	9.00
C415 C416	17-0.63E476Y	ELEC CAPA	9.00
C417 C418	17-5F273J	MYLAR CAPA	8.90
C419 C420	17-5F104J	MYLAR CAPA	13.00
C421 C422	17-3.5E476Y	ELEC CAPA	14.00
C423	17-5D104M	CER CAPA	10.00
C425 C426	17-2.5E106Y	ELEC CAPA	12.00
C427 C428	17-5D104M	CER CAPA	10.00
C501 C502	17-5F122J	MYLAR CAPA	6.50
C503 C504	17-5F224J	MYLAR CAPA	20.00
C505 C506	17-5F104J	MYLAR CAPA	13.00
C507 C508	17-5F104J	MYLAR CAPA	13.00
C509 C510	17-5D101M	CER CAPA	3.50
C511 C512	17-5D100D	CER CAPA	3.50
C513 C514	17-0.63E476Y	ELEC CAPA	9.00
C515 C516	17-5D221M	CER CAPA	4.00
C517 C518	17-0.63E476Y	ELEC CAPA	9.00
C519 C520	17-5F183J	MYLAR CAPA	8.90
C521 C522	17-5F104J	MYLAR CAPA	13.00
C523 C524	17-0.63E476Y	ELEC CAPA	9.00
C525 C526	17-5D124J	MYLAR CAPA	13.00
C527 C528	17-1.6R684K	AI CAPA	38.00
C529 C530	17-5F102J	MYLAR CAPA	6.50
C531 C532	17-2.5E476Y	ELEC CAPA	14.00
C533	17-5E107Y	ELEC CAPA	30.00
C534	17-3.5E107Y	ELEC CAPA	24.20
C601 C602	17-1.6R105K	AI CAPA	25.00
C603 C604	17-1.6R105K	AI CAPA	25.00
C605 C606	17-0.63E476Y	ELEC CAPA	9.00
C609 C610	17-5F272J	MYLAR CAPA	6.50
C611 C612	17-5F102J	MYLAR CAPA	6.50
C613 C614	17-5F102J	MYLAR CAPA	6.50
C615 C616	17-0.63E108Y	ELEC CAPA	32.50
C617 C618	17-5D470M	CER CAPA	3.50
C619 C620	17-5D220M	CER CAPA	3.50
C621 C622	17-5D220M	CER CAPA	3.50
C625 C626	17-2.5E476Y	ELEC CAPA	14.00
C627 C628	17-5F104J	MYLAR CAPA	13.00
C629 C630	17-5D101M	CER CAPA	3.50
C631 C632	17-5F102J	MYLAR CAPA	6.50
C633 C634	17-5F104J	MYLAR CAPA	13.00
C635 C636	17-5D104M	CER CAPA	10.00
C637 C638	17-5D104M	CER CAPA	10.00
C641 C642	17-5D104M	CER CAPA	10.00
C643 C644	17-5D104M	CER CAPA	10.00
C645 C646	17-5D220M	CER CAPA	3.50
C647	17-5F102J	MYLAR CAPA	6.50
C701 C702	17-0.63E476Y	ELEC CAPA	9.00
C703 C704	17-0.63E476Y	ELEC CAPA	9.00
C801 C802	17-35E228Y	ELEC CAPA	106.00
C803 C804	17-3.5E228Y	ELEC CAPA	106.00
C805 C806	17-3.5E337Y	ELEC CAPA	46.80
C808	17-5D220M	CER CAPA	3.50
C809	17-1.0E476Y	ELEC CAPA	10.00
C807	17-2.5E106Y	ELEC CAPA	12.00
C810	17-1.6E106Y	ELEC CAPA	8.40
C811	17-3.5E476Y	ELEC CAPA	14.00
C901	17-3.5E108Y	ELEC CAPA	93.00

SYMBOL NO	PARTS NO	DESCRIPTION	REF
R701,R702	16-¼ CN224J	CARBON RES	220K OHM ¼W±5%
R703,R704	16-¼ CN682J	CARBON RES	6K8 OHM ¼W±5%
R705,R706	16-¼ CN331J	CARBON RES	330 OHM ¼W±5%
R707,R708	16-¼ CN561J	CARBON RES	560 OHM ¼W±5%
R709,R710	16-¼ CN561J	CARBON RES	560 OHM ¼W±5%
R711,R712	16-¼ CN331J	CARBON RES	330 OHM ¼W±5%
R713,R714	16-¼ CN682J	CARBON RES	6K8 OHM ¼W±5%
R715	16-¼ CN152J	CARBON RES	1K5 OHM ¼W±5%
R801	16-¼ CN222J	CARBON RES	2K2 OHM ¼W±5%
R802	16-¼ CN102J	CARBON RES	1K OHM ¼W±5%
R803	16-¼ CN152J	CARBON RES	1K5 OHM ¼W±5%
R804	16-¼ CN152J	CARBON RES	1K5 OHM ¼W±5%
R805	16-¼ CN102J	CARBON RES	1K OHM ¼W±5%
R806	16-¼ CN102J	CARBON RES	1K OHM ¼W±5%
R807	16-¼ CN273J	CARBON RES	27K OHM ¼W±5%
R808	16-¼ CN822J	CARBON RES	8K2 OHM ¼W±5%
R809	16-¼ CN393J	CARBON RES	39K OHM ¼W±5%
R810	16-¼ CN333J	CARBON RES	33K OHM ¼W±5%
R811	16-½ CN275J	CARBON RES	2M7 OHM ½W±5%
R901	16-½ CN100J	CARBON RES	10 OHM ½W±5%
R902	16-¼ CN122J	CARBON RES	1K2 OHM ¼W±5%
R903	16-¼ CN122J	CARBON RES	1K2 OHM ¼W±5%
C101	17-5D473M	CER CAPA	0.047 µF 50V±20%
C102	17-5D473M	CER CAPA	0.047 µF 50V±20%
C103	17-5D473M	CER CAPA	0.047 µF 50V±20%
C104	17-5D103M	CER CAPA	0.01 µF 50V±20%
C105	17-5D103M	CER CAPA	0.01 µF 50V±20%
C106	17-5D473M	CER CAPA	0.047 µF 50V±20%
C107	17-5D473M	CER CAPA	0.047 µF 50V±20%
C108	17-5D473M	CER CAPA	0.047 µF 50V±20%
C109	17-5D473M	CER CAPA	0.047 µF 50V±20%
C110	17-5D331M	CER CAPA	330PF 50V±20%
C111	17-205E105Y	ELEC CAPA	1 µF 25V+50%-10%
C112	17-5D473M	CER CAPA	0.047 µF 50V±20%
C113	17-2.5E105Y	ELEC CAPA	1 µF 25V+50%-10%
C114	17-5D473M	CER CAPA	0.047 µF 50V±20%
C115	17-5D473M	CER CAPA	0.047 µF 50V±20%
C116	17-1.6E227Y	ELEC CAPA	220 µF 16V±50%-10%
C117	17-5D473M	CER CAPA	0.047 µF 50V±20%
C118	17-2.5E105Y	ELEC CAPA	1 µF 25V+50%-10%
C119	17-5D473M	CER CAPA	0.047 µF 50V±20%
C120	17-5D473M	CER CAPA	0.047 µF 50V±20%
C121	17-5D473M	CER CAPA	0.047 µF 50V±20%
C122	17-2.5E475Y	ELEC CAPA	4.7 µF 25V+75%-10%
C123	17-5D102M	CER CAPA	1000PF 50V±20%
C124	17-1.6E107Y	ELEC CAPA	100 µF 16V+50%-10%
C125	17-5D473M	CER CAPA	0.047 µF 50V±20%
C126	17-5D473M	CER CAPA	0.047 µF 50V±20%
C201	17-1.6O224M	TA. CAPA	0.22 µF 16V±20%
C202	17-5F473J	MYLAR CAPA	0.047 µF 50V±5%
C203	17-2.5E475Y	ELEC CAPA	4.7 µF 25V+50-10%
C204	17-5U471J	STYROLENE CAPA	470PF 50V±5%
C205	17-1.6O224M	TA. CAPA	0.22 µF 16V±20%
C206	17-1.6O474M	TA. CAPA	0.47 µF 16V±20%
C207	17-1.6E107Y	ELEC CAPA	100 µF 16V+50-10%
C208	17-5U821J	STYROLENE CAPA	820PF 50V±5%
C209	17-5U821J	STYROLENE CAPA	820PF 50V±5%
C210	17-5F562J	MYLAR CAPA	0.0056 µF 50V±5%
C211	17-5F562J	MYLAR CAPA	0.0056 µF 50V±5%
C212	17-5F123J	MYLAR CAPA	0.012 µF 50V±5%
C213	17-5F123J	MYLAR CAPA	0.012 µF 50V±5%
C214	17-5U821J	STYROLENE CAPA	820PF 50V±5%
C215	17-5U821J	STYROLENE CAPA	820PF 50V±5%
C216	17-5F682J	MYLAR CAPA	0.0068 µF 50V±5%
C217	17-5F682J	MYLAR CAPA	0.0068 µF 50V±5%
C218	17-2.5E475Y	ELEC CAPA	4.7 µF 25V+50-10%
C219	17-2.5E475Y	ELEC CAPA	4.7 µF 25V+50-10%
C220	17-1.6E107Y	ELEC CAPA	100 µF 16V+50-10%
C221	17-1.6E107Y	ELEC CAPA	100 µF 16V+50-10%
C222	17-1.6E106Y	ELEC CAPA	10 µF 16V+50-10%
C223	17-1.6E106Y	ELEC CAPA	10 µF 16V+50-10%
C224	17-1.0S107Y	NON-POLAR CAPA	100 µF 10V+50-10%
C225	17-2.5E105Y	ELEC CAPA	1 µF 25V+50-10%
C226	17-2.5E475Y	ELEC CAPA	4.7 µF 25V+50-10%
C227	17-2.5E475Y	ELEC CAPA	4.7 µF 25V+50-10%
C301	17-5D150K	CER CAPA	15PF 50V±10%
C302	17-5U361J	STYROLENE CAPA	360PF 50V±5%
C303	17-5D103M	CER CAPA	0.01 µF 50V±20%
C304	17-5D103M	CER CAPA	0.01 µF 50V±20%
C305	17-5D102M	CER CAPA	1000PF 50V±20%



SYMBOL NO	PARTS NO	DESCRIPTION	REF
C902	17-3.5E337Y	ELEC CAPA 330 $\mu$ /35V+50-10%	46.80
C903	17-1.6E107Y	ELEC CAPA 100 $\mu$ /16V+50-10%	14.60
L101	29-1037	INDUCTOR 1MH $\pm$ 10%	16.00
L102	29-1034	INDUCTOR 22 $\mu$ H $\pm$ 10%	15.00
L103	29-1034	INDUCTOR 22 $\mu$ H $\pm$ 10%	15.00
L104	29-1039T	INDUCTOR 18 $\mu$ H $\pm$ 10%	11.00
L105	29-1038	INDUCTOR 40 $\mu$ H $\pm$ 10%	15.00
L106	29-1051	INDUCTOR 2.2 $\mu$ H $\pm$ 10%	10.00
L601,L602	29-1040	INDUCTOR 1 $\mu$ H $\pm$ 10%	3.50
T101	29-3008T	FM DETECTOR COIL 10.7MHZ	96.00
T301	29-3018	AM OSC COIL	25.00
T302	29-3032	AM IFT WITH CERAMIC FILTER	134.00
T303	29-3029	AM IFT	25.00
CF101	29-3027	CER FILTER SFE 10.7MA8	61.50
CF102	29-3027	CER FILTER SFE 10.7MA8	61.50
CF103	29-3027	CER FILTER SFE 10.7MA8	61.50
LPF201	29-3049	LOW PASS FILTER 19, 38K HZ	180.00
LPF202	29-3049	LOW PASS FILTER 19,38K HZ	180.00
VR101	29-4023	SEMIFIXED RES 20KB	18.00
VR201	29-4077	SEMIFIXED RES 10KB	18.00
VR202	29-4022	SEMIFIXED RES 5KB	18.00
VR601,VR602	29-4023	SEMIFIXED RES 20KB	18.00
VR501	29-4103A	VOLUME & BALANCE CONTROL	400.00
VR502,VR503	29-4075F	TONE CONTROL 10KC $\times$ 2	180.00
	29-5008	AM ANT BAR	290.00
D101	30-1044	ZENER DIODE 15V 500MW $\pm$ 5%	14.80
D102	30-1019	DIODE BAW62	11.00
D103	30-1019	DIODE BAW62	11.00
D104	30-1019	DIODE BAW62	11.00
D105	30-1019	DIODE BAW62	11.00
D106	30-1019	DIODE BAW62	11.00
D107	30-1019	DIODE BAW62	11.00
D501,D502	30-1019	DIODE BAW62	11.00
D503,D504	30-1019	DIODE BAW62	11.00
D601,D602	30-1019	DIODE BAW62	11.00
D603,D604	30-1019	DIODE BAW62	11.00
D701 D702	30-1019	DIODE BAW62	11.00
D703 D704	30-1019	DIODE BAW62	11.00
D801 D802	30-1002	DIODE 1N4002	14.00
D803 D804	30-1002	DIODE 1N4002	14.00
D806	30-1078	DIODE BAV19	12.80
BD801	30-1049	BRIDGE DIODE KBL02	76.00
ZD801	30-1041N	ZENER DIODE 22V 500MW	20.00
D901,D902	30-1078	DIODE BAV19	12.80
D903	30-1044	ZENER DIODE 15V	20.00
LD101	30-1071	LED ORANGE	15.00
LD102	30-1071	LED ORANGE	15.00
LD103	30-1073	LED GREEN	15.00
LD201	30-1073	LED GREEN	15.00
LD701	30-1073	LED GREEN	15.00
Q101	30-2019	TRANSISTOR 2SC930C	23.00
Q102	30-2156	TRANSISTOR 2SC1815GR	14.00
Q103	30-2156	TRANSISTOR 2SC1815GR	14.00
Q201	30-2084-3	TRANSISTOR BC549C	22.80
Q202	30-2084-3	TRANSISTOR BC549C	22.80
Q203	30-2156	TRANSISTOR 2SC1815GR	14.00
Q204	30-2156	TRANSISTOR 2SC1815GR	14.00
Q301	30-2084-3	TRANSISTOR BC549C	22.80
Q401,Q402	30-2084-3	TRANSISTOR BC549C	22.80
Q403,Q404	30-2085-2	TRANSISTOR BC559B	22.80
Q405,Q406	30-2085-2	TRANSISTOR BC559B	22.80
Q407,Q408	30-2096	TRANSISTOR BC556A	24.70
Q409,Q410	30-2156	TRANSISTOR 2SC1815GR	14.00
Q411,Q412	30-2096	TRANSISTOR BC556A	24.70
Q501,Q502	30-2085-2	TRANSISTOR BC559B	22.80
Q503,Q504	30-2084-3	TRANSISTOR BC549C	22.80
Q505,Q506	30-2156	TRANSISTOR 2SC1815GR	14.00
Q507,Q508	30-2096	TRANSISTOR BC556A	24.70
Q509,Q510	30-2232	FET E111	104.00
Q601,Q602	30-2084-3	TRANSISTOR BC549C	22.80
Q603,Q604	30-2096	TRANSISTOR BC556A	24.70
Q605,Q606	30-2096	TRANSISTOR BC556A	24.70
Q607,Q608	30-2083	TRANSISTOR BD139	53.20
Q609,Q610	30-2083	TRANSISTOR BD139	53.20
Q611,Q612	30-2169	TRANSISTOR 2N6553	80.00
Q613,Q614	30-2070	TRANSISTOR 2N6556	80.00
Q615,Q616	30-2104M	TRANSISTOR MJ3055	152.00
Q617,Q618	30-2114M	TRANSISTOR 2N2955	159.60
Q801	30-2082	TRANSISTOR BD140	58.90
Q802	30-2156	TRANSISTOR 2SC1815GR	14.00

SYMBOL NO	PARTS NO	DESCRIPTION	REF
R101	16-¼CU330J	CARBON RES 33 OHM ¼W ±5%	1.70
R102	16-¼CU391J	CARBON RES 390 OHM ¼W ±5%	1.70
R103	16-¼CU331J	CARBON RES 330 OHM ¼W ±5%	1.70
R104	16-¼CU391J	CARBON RES 390 OHM ¼W ±5%	1.70
R105	16-¼CU153J	CARBON RES 15K OHM ¼W ±5%	1.70
R106	16-¼CU103J	CARBON RES 10K OHM ¼W ±5%	1.70
R107	16-¼CU222J	CARBON RES 2K2 OHM ¼W ±5%	1.70
R108	16-¼CU330J	CARBON RES 33 OHM ¼W ±5%	1.70
R109	16-¼CN331J	CARBON RES 330 OHM ¼W ±5%	1.70
R110	16-¼CU103J	CARBON RES 10K OHM ¼W ±5%	1.70
R111	16-¼CU331J	CARBON RES 330 OHM ¼W ±5%	1.70
R112	16-¼CU563J	CARBON RES 56K OH ¼W ±5%	1.70
R113	16-¼CU123J	CARBON RES 12K OHM ¼W ±5%	1.70
R114	16-¼CU222J	CARBON RES 2K2 OHM ¼W ±5%	1.70
R115	16-¼CN272J	CARBON RES 2K7 OHM ¼W ±5%	1.70
R116	16-¼CN562J	CARBON RES 5K6 OHM ¼W ±5%	1.70
R117	16-¼CN221J	CARBON RES 220 OHM ¼W ±5%	1.70
R118	16-¼CN223J	CARBON RES 22K OHM ¼W ±5%	1.70
R119	16-¼CU101J	CARBON RES 100 OHM ¼W ±5%	1.70
R120	16-¼CU224J	CARBON RES 220K OHM ¼W ±5%	1.70
R121	16-¼CN560J	CARBON RES 56 OHM ¼W ±5%	1.70
R122	16-¼CU104J	CARBON RES 100K OHM ¼W ±5%	1.70
R123	16-¼CN104J	CARBON RES 100K OHM ¼W ±5%	1.70
R124	16-¼CU684J	CARBON RES 680K OHM ¼W ±5%	1.70
R125	16-¼CU684J	CARBON RES 680K OHM ¼W ±5%	1.70
R126	16-¼CN102J	CARBON RES 1K OHM ¼W ±5%	1.70
R127	16-½CN681J	CARBON RES 680 OHM ½W ±5%	2.40
R128	16-¼CN103J	CARBON RES 10K OHM ¼W ±5%	1.70
R129	16-¼CU122J	CARBON RES 1K2 OHM ¼W ±5%	1.70
R130	16-¼CU563J	CARBON RES 56K OHM ¼W ±5%	1.70
R131	16-¼CU123J	CARBON RES 12K OHM ¼W ±5%	1.70
R132	16-¼CU331J	CARBON RES 330 OHM ¼W ±5%	1.70
R133	16-¼CU473J	CARBON RES 47K OHM ¼W ±5%	1.70
R134	16-¼CU473J	CARBON RES 47K OHM ¼W ±5%	1.70
R135	16-¼CU473J	CARBON RES 47K OHM ¼W ±5%	1.70
R201	16-¼CN181J	CARBON RES 180 OHM ¼W ±5%	1.70
R202	16-¼CU153J	CARBON RES 15K OHM ¼W ±5%	1.70
R203	16-¼CU223J	CARBON RES 22K OHM ¼W ±5%	1.70
R204	16-¼CU102J	CARBON RES 1K OHM ¼W ±5%	1.70
R205	16-¼CN102J	CARBON RES 1K OHM ¼W ±5%	1.70
R206	16-¼CU392J	CARBON RES 3K9 OHM ¼W ±5%	1.70
R207	16-¼CU392J	CARBON RES 3K9 OHM ¼W ±5%	1.70
R208	16-¼CU564J	CARBON RES 560K OHM ¼W ±5%	1.70
R209	16-¼CU564J	CARBON RES 560K OHM ¼W ±5%	1.70
R210	16-¼CN332J	CARBON RES 3K3 OHM ¼W ±5%	1.70
R211	16-¼CN332J	CARBON RES 3K3 OHM ¼W ±5%	1.70
R212	16-¼CU331J	CARBON RES 330 OHM ¼W ±5%	1.70
R213	16-¼CU331J	CARBON RES 330 OHM ¼W ±5%	1.70
R214	16-¼CN102J	CARBON RES 1K OHM ¼W ±5%	1.70
R215	16-¼CU102J	CARBON RES 1K OHM ¼W ±5%	1.70
R216	16-¼CU392J	CARBON RES 3K9 OHM ¼W ±5%	1.70
R217	16-¼CU392J	CARBON RES 3K9 OHM ¼W ±5%	1.70
R218	16-¼CN102J	CARBON RES 1K OHM ¼W ±5%	1.70
R219	16-¼CU102J	CARBON RES 1K OHM ¼W ±5%	1.70
R220	16-¼CU103J	CARBON RES 10K OHM ¼W ±5%	1.70
R221	16-¼CU223J	CARBON RES 22K OHM ¼W ±5%	1.70
R222	16-¼CU223J	CARBON RES 22K OHM ¼W ±5%	1.70
R223	16-¼CU473J	CARBON RES 47K OHM ¼W ±5%	1.70
R224	16-¼CU332J	CARBON RES 3K3 OHM ¼W ±5%	1.70
R225	16-¼CU332J	CARBON RES 3K3 OHM ¼W ±5%	1.70
R226	16-¼CU104J	CARBON RES 100K OHM ¼W ±5%	1.70
R227	16-¼CU104J	CARBON RES 100K OHM ¼W ±5%	1.70
R301	16-¼CU470J	CARBON RES 47 OHM ¼W ±5%	1.70
R302	16-¼CU151J	CARBON RES 150 OHM ¼W ±5%	1.70
R303	16-¼CU152J	CARBON RES 1K5 OHM ¼W ±5%	1.70
R304	16-¼CN331J	CARBON RES 330 OHM ¼W ±5%	1.70
R305	16-¼CU562J	CARBON RES 5K6 OHM ¼W ±5%	1.70
R306	16-¼CN151J	CARBON RES 150 OHM ¼W ±5%	1.70
R307	16-¼CU103J	CARBON RES 10K OHM ¼W ±5%	1.70
R308	16-¼CU103J	CARBON RES 10K OHM ¼W ±5%	1.70
R309	16-¼CU272J	CARBON RES 2K7 OHM ¼W ±5%	1.70
R310	16-¼CU181J	CARBON RES 180 OHM ¼W ±5%	1.70
R311	16-¼CU273J	CARBON RES 27K OHM ¼W ±5%	1.70
R312	16-¼CU273J	CARBON RES 27K OHM ¼W ±5%	1.70
R313	16-¼CU154J	CARBON RES 150K OHM ¼W ±5%	1.70
R314	16-¼CU331J	CARBON RES 330 OHM ¼W ±5%	1.70
R315	16-¼CN122J	CARBON RES 1K2 OHM ¼W ±5%	1.70
R316	16-¼CU104J	CARBON RES 100K OHM ¼W ±5%	1.70
R317	16-¼CU103J	CARBON RES 10K OHM ¼W ±5%	1.70
R318	16-¼CU103J	CARBON RES 10K OHM ¼W ±5%	1.70

SYMBOL NO	PARTS NO	DESCRIPTION	REF
R319	16-1/4 CU104J	CARBON RES 100K OHM 1/4W ± 5%	1.70
R320	16-1/4 CU104J	CARBON RES 100K OHM 1/4W ± 5%	1.70
R401,R402	16-1/4 CN334J	CARBON RES 330K OHM 1/4W ± 5%	1.70
R403,R404	16-1/4 CN563J	CARBON RES 56K OHM 1/4W ± 5%	1.70
R405,R406	16-1/4 CN222J	CARBON RES 2K2 OHM 1/4W ± 5%	1.70
R407,R408	16-1/4 CN222J	CARBON RES 2K2 OHM 1/4W ± 5%	1.70
R409,R410	16-1/4 CU392J	CARBON RES 3K9 OHM 1/4W ± 5%	1.70
R411,R412	16-1/4 CU560J	CARBON RES 56 OHM 1/4W ± 5%	1.70
R413,R414	16-1/4 CU684J	CARBON RES 680K OHM 1/4W ± 5%	1.70
R415,R416	16-1/4 CN331J	CARBON RES 330 OHM 1/4W ± 5%	1.70
R417,R418	16-1/4 CN151J	CARBON RES 150 OHM 1/4W ± 5%	1.70
R419,R420	16-1/4 CU221J	CARBON RES 220 OHM 1/4W ± 5%	1.70
R421,R422	16-1/4 CN681J	CARBON RES 680 OHM 1/4W ± 5%	1.70
R423,R424	16-1/4 CU562J	CARBON RES 5K6 OHM 1/4W ± 5%	1.70
R425,R426	16-1/4 CU472J	CARBON RES 4K7 OHM 1/4W ± 5%	1.70
R427,R428	16-1/4 CU272J	CARBON RES 2K7 OHM 1/4W ± 5%	1.70
R429,R430	16-1/4 CN333J	CARBON RES 33K OHM 1/4W ± 5%	1.70
R431,R432	16-1/4 CN153J	CARBON RES 15K OHM 1/4W ± 5%	1.70
R433,R434	16-1/4 CN821J	CARBON RES 820 OHM 1/4W ± 5%	1.70
R435,R436	16-1/4 CN680J	CARBON RES 68 OHM 1/4W ± 5%	1.70
R437,R438	16-1/4 CN680J	CARBON RES 68 OHM 1/4W ± 5%	1.70
R439,R440	16-1/4 CU681J	CARBON RES 680 OHM 1/4W ± 5%	1.70
R441,R442	16-1/4 CU224J	CARBON RES 220K OHM 1/4W ± 5%	1.70
R501,R502	16-1/4 CU181J	CARBON RES 180 OHM 1/4W ± 5%	1.70
R503,R504	16-1/4 CN562J	CARBON RES 5K6 OHM 1/4W ± 5%	1.70
R505,R506	16-1/4 CN224J	CARBON RES 220K OHM 1/4W ± 5%	1.70
R507,R508	16-1/4 CN104J	CARBON RES 100K OHM 1/4W ± 5%	1.70
R509,R510	16-1/4 CU272J	CARBON RES 2K7 OHM 1/4W ± 5%	1.70
R511,R512	16-1/4 CN224J	CARBON RES 220K OHM 1/4W ± 5%	1.70
R513,R514	16-1/4 CU104J	CARBON RES 100K OHM 1/4W ± 5%	1.70
R515,R516	16-1/4 CN391J	CARBON RES 390 OHM 1/4W ± 5%	1.70
R517,R518	16-1/4 CU822J	CARBON RES 8K2 OHM 1/4W ± 5%	1.70
R519,R520	16-1/4 CN392J	CARBON RES 3K9 OHM 1/4W ± 5%	1.70
R521,R522	16-1/4 CN682J	CARBON RES 6K8 OHM 1/4W ± 5%	1.70
R525,R524	16-1/4 CN682J	CARBON RES 6K8 OHM 1/4W ± 5%	1.70
R525,R526	16-1/4 CU562J	CARBON RES 5K6 OHM 1/4W ± 5%	1.70
R527,R528	16-1/4 CN680J	CARBON RES 68 OHM 1/4W ± 5%	1.70
R529,R530	16-1/4 CN680J	CARBON RES 68 OHM 1/4W ± 5%	1.70
R531,R532	16-1/4 CN102J	CARBON RES 1K OHM 1/4W ± 5%	1.70
R533,R534	16-1/4 CN181J	CARBON RES 180 OHM 1/4W ± 5%	1.70
R535,R536	16-1/4 CN473J	CARBON RES 47K OHM 1/4W ± 5%	1.70
R537,R538	16-1/4 CN332J	CARBON RES 3K3 OHM 1/4W ± 5%	1.70
R539,R540	16-1/4 CN561J	CARBON RES 560 OHM 1/4W ± 5%	1.70
R543	16-1/4 CN122J	CARBON RES 1K2 OHM 1/4W ± 5%	1.70
R546	16-1/4 CN273J	CARBON RES 27K OHM 1/4W ± 5%	1.70
R547	16-1/4 CN184J	CARBON RES 180K OHM 1/4W ± 5%	1.70
R548	16-1/4 CN391J	CARBON RES 390 OHM 1/4W ± 5%	1.70
R549,R550	16-1/4 CU682J	CARBON RES 6K8 OHM 1/4W ± 5%	1.70
R551,R552	16-1/4 CU680J	CARBON RES 680 OHM 1/4W ± 5%	1.70
R553,R554	16-1/4 CN106J	CARBON RES 10M OHM 1/4W ± 5%	1.70
R601,R602	16-1/4 CN681J	CARBON RES 680 OHM 1/4W ± 5%	1.70
R603,R604	16-1/4 CN562J	CARBON RES 5K6 OHM 1/4W ± 5%	1.70
R605,R606	16-1/4 CN223J	CARBON RES 22K OHM 1/4W ± 5%	1.70
R607,R608	16-1/4 CN391J	CARBON RES 390 OHM 1/4W ± 5%	1.70
R609,R610	16-1/4 CN223J	CARBON RES 22K OHM 1/4W ± 5%	1.70
R611,R612	16-1/4 CN122J	CARBON RES 1K2 OHM 1/4W ± 5%	1.70
R613,R614	16-1/4 CN561J	CARBON RES 560 OHM 1/4W ± 5%	1.70
R617,R618	16-1/4 CN222J	CARBON RES 2K2 OHM 1/4W ± 5%	1.70
R619,R620	16-1/4 CN222J	CARBON RES 2K2 OHM 1/4W ± 5%	1.70
R621,R622	16-1/4 CN183J	CARBON RES 18K OHM 1/4W ± 5%	1.70
R623,R624	16-1/4 CN391J	CARBON RES 390 OHM 1/4W ± 5%	1.70
R625,R626	16-1/2 CN471J	CARBON RES 470 OHM 1/2W ± 5%	2.40
R627,R628	16-1/4 MN330J	METAL FILM RES 33 OHM 1/4W ± 5%	1.70
R629,R630	16-1/4 CN391J	CARBON RES 390 OHM 1/4W ± 5%	1.70
R631,R632	16-1/4 CN270J	CARBON RES 27 OHM 1/4W ± 5%	1.70
R633,R634	16-1/4 CN470J	CARBON RES 47 OHM 1/4W ± 5%	1.70
R635,R636	16-1/2 CN152J	CARBON RES 1K5 OHM 1/2W ± 5%	2.40
R637,R638	16-1/2 CN122J	CARBON RES 1K2 OHM 1/2W ± 5%	2.40
R639,R640	16-1/4 CN391J	CARBON RES 390 OHM 1/4W ± 5%	1.70
R641,R642		CARBON RES RX OHM 1/4W ± 5%	1.70
R643,R644	16-1/4 CN680J	CARBON RES 68 OHM 1/4W ± 5%	1.70
R645,R646	16-1/4 CN391J	CARBON RES 390 OHM 1/4W ± 5%	1.70
R647,R648	16-1/4 CN181J	CARBON RES 180 OHM 1/4W ± 5%	1.70
R649,R650	16-1/2 CN122J	CARBON RES 1K2 OHM 1/2W ± 5%	2.40
R651,R652	16-1/4 CN181J	CARBON RES 180 OHM 1/4W ± 5%	1.70
R653,R654	16- 1A100J	METAL OXIDE RES 10 OHM 1W ± 5%	7.50
R655,R656	16- 1A221J	METAL OXIDE RES 220 OHM 1W ± 5%	7.50
R657,R658	16- 1A101J	METAL OXIDE RES 100 OHM 1W ± 5%	7.50
R659,R660	16-1/4 CN1R0J	CARBON RES 1 OHM 1/4W ± 5%	1.70
R661,R662	16- 1A100J	METAL OXIDE RES 10 OHM 1W ± 5%	7.50

<b>SYMBOL NO</b>	<b>PARTS NO</b>	<b>DESCRIPTION</b>	<b>REF</b>
Q803	30-2096	TRANSISTOR BC556A	24.7
Q804	30-2082	TRANSISTOR BD140	58.90
Q901	30-2178	TRANSISTOR 2SD330	76.00
IC101	30-3035	IC HA1211	115.00
IC102	30-3070	IC LA1231N	280.00
IC103	30-3032	IC CA1458	108.00
IC201	30-3015	IC HA1156	180.00
IC301	30-3036	IC HA1197	236.00
SW1	31-1135	FUNCTION SW SRZ-L5	265.00
SW2-SW4	31-1094F	PUSH SW 4KEY-2U	220.00
SW5	31-1139	SLIDE SW SSB42	75.00
SW6	31-1024	SPEAKER SW SRZ-44	220.00
TB1 TB2	35-3011	BREAKER A-22	88.00
SW7	31-1129A	POWER SW	300.00
SW8	31-1121	VOLTAGE SELECTOR SW	169.20
SW9	31-1079 * F	DE-EMPHASIS SW	53.00