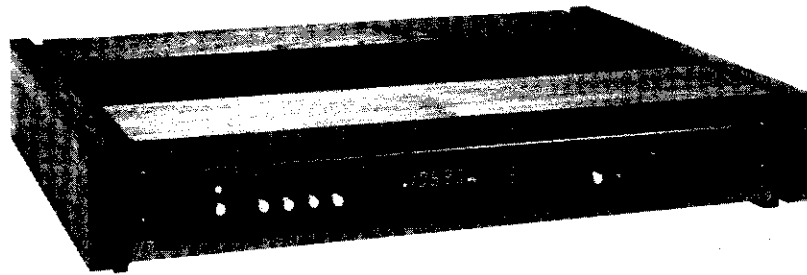




SERVICE MANUAL

**PFM/FM THREE
AM/FM-STEREO TUNER**



SERVICE MANUAL

PFM/FM THREE AM/FM-STEREO TUNER

Crown International, Inc. 1718 W. Mishawaka Rd. Elkhart, Indiana 46517

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Note: The information in this manual is written for the experienced technician and is intended for their use only.

Should you need additional technical assistance, please contact the Technical Service Department, Crown International, Inc., 1718 W. Mishawaka Road, Elkhart, Indiana 46517. Phone (219) 294-8000.

Caution: Unauthorized service performed during the Crown Warranty Period could result in voiding the warranty. Refer servicing during this period to a Crown Authorized Service Center.



REVIEW SECTION

I. Introduction

This service manual applies to the FM THREE and the PFM THREE versions.

The purpose of this manual is to provide technical service information so that a qualified service technician may quickly troubleshoot, repair and complete a thorough checkout of the FM THREE Tuner. It is highly recommended that the user of this manual take time to become familiar with the operation and circuit theory of the FM THREE in order to make a more efficient repair of the unit. Illustrated parts lists, exploded view drawing and schematics are provided to locate and identify various components. When ordering parts from Crown Parts Department both the Crown Part Number and schematic designation, if any, along with the serial number of the unit is needed to insure that your order is quickly and correctly processed.

Note: The information in this manual is intended for use by a qualified technician only!

II. Features

The Crown FM THREE is a high-quality AM/FM-stereo tuner using the latest tuner technology to provide outstanding performance in the AM and FM bands.

The FM THREE incorporates the new Schotz Noise Reduction™ circuit (SNR), which clarifies previously unlistenable stereo channels. The unit also features a "scan level" control, which allows you to adjust how strong a signal must be before the tuner stops scanning and locks onto a channel. Other features include six AM and six FM memory PRESETs, STEREO/ MONO switch, adjustable output level, AM antenna, SIGNAL-STRENGTH LEDs, and a MULTIPATH indicator.

The SNR technology is United States and Foreign patent pending. "Schotz" and "Schotz Noise Reduction" are trademarks of LS Research, Inc..

III. General Specifications

All specifications conform to IEEE/IHF standards. Tests done with 300 ohm input impedance.

Connectors: 75 ohm unbalanced antenna input-F type, output RCA phono jacks.

Display: A fluorescent indicator panel includes AM/FM indicators, kHz/MHz indicators and frequency display. Amber POWER LED; red STEREO LED; yellow MULTIPATH LED; amber MEMORY LED; six green PRE SET LEDs; five green LED SIGNAL STRENGTH indicators.

Power Requirements: 120V 50/60Hz 7 watts; 100, 200, 220, and 240 volts also available.

Dimensions: 1 3/4" H (4.4cm), 19" W (48.3cm), 11 1/2" D (29.8cm) from mounting surface.

Finish: Two finishes are available: black polyester vinyl-coated aluminum front panel (shown in this manual) or a brushed and satinized aluminum front panel. Zinc diecast end caps.

Weight: Approximately 8 lbs. (3.6kg).

FM Specifications

Tuning range: U.S. frequencies 87.5 to 108MHz; European frequencies 87.5 to 108 MHz (or 104MHz).

Antenna Inputs: 75 ohms unbalanced; 300 ohms balanced with balun (supplied).

Detector Type: Phase-Locked-Loop (PLL)

Intermediate Frequency (IF): 10.7MHz.

Sensitivity: 9.31dBf (1.6 microvolts), 75-ohm input.

Quieting: 50dB mono 14.2dBf (2.8 microvolts); 50dB stereo 30.3dBf (18 microvolts) with SNR on, 36dBf (34.7 microvolts) with SNR off.

Signal-To-Noise Ratio: Mono 80dB, stereo 75dB at 65dBf.

Hum and Noise: 75dB.

Total Harmonic Distortion: 0.06% (mono or stereo) at 65dBf at 1kHz.

Capture Ratio: 1.5dB at 65dBf.
Alternate Channel Selectivity: 75dB at 25dBf.
Frequency Response: +/- 0.5dB 30Hz-15kHz.
Image Response Ratio: Greater than 120dB.
IF Response Ratio: Greater than 114dB.
RF Intermodulation: 65dB.
AM Suppression Ratio: Greater than 80dB.
Subcarrier Product Ratio: 70dB.
SCA Rejection Ratio: 70dB.
Spurious Response Ratio: Greater than 114dB.

AM Specifications

Tuning Range: 520kHz-1610kHz.
Usable Sensitivity: 300 microvolts/meter.
Total Harmonic Distortion: 0.22% @ 30% modulation.
Signal-To-Noise Ratio: 52dB @ 30% modulation.

IV. Controls and Adjustments

The following paragraphs refer to the front and rear drawings, Fig. RVW.1 and Fig. RVW.2.

A. POWER Switch and Indicator

This pushbutton switch activates the FM THREE and causes the amber indicator, located directly above, to glow. The station that was tuned before removing power will re-appear upon turn-on.

B. AM/FM Selector

Switches reception to AM or FM.

C. SNR (Schotz Noise Reduction)

When this switch is **in**, the SNR circuit is activated, reducing background noise on weak or distant stereo stations. When the switch is **out**, the SNR circuit is off.

D. STEREO/MONO

Depressing this switch produces a mono output and turns off the stereo indicator. If you're receiving an extremely noisy or weak stereo signal, the Mono position will reduce the noise (but will eliminate stereo separation).

E. SCAN LEVEL

This control allows you to adjust how strong a signal must be before the tuner stops scanning and locks onto a channel. (See SCAN LOCK and SCAN TUNE). Turn the control counterclockwise to make the scan stop on weaker stations; turn the control clockwise to stop only on stronger stations.

F. STEREO Indicator

Any time stereo program material is being received by the FM THREE, the STEREO indicator light will glow. During the reception of weak stereo signals, the lamp may flicker. This is normal and indicates that either another, stronger station should be selected or that the

STEREO/MONO switch should be in the Mono position for clearer reception. As mentioned previously, if the unit is set to Mono mode, the STEREO indicator light will go out.

G. MULTIPATH Indicator

This light indicates when the tuner is receiving multipath interference (station signal reflections off buildings, mountains, etc.) The MULTIPATH indicator normally lights in sync with the audio signal when multipath signals are present.

H. AM/FM Indicator

This displays the tuner reception mode (AM or FM).

I. Numerical Readout Display

The frequency at which the FM THREE is tuned is shown on the main Numerical Readout display. Upon powering up, the unit will display the station that was last tuned before turn-off. In most cases, the FM THREE is set up to receive and display American frequencies. During tuning, the FM THREE steps every 100kHz beginning at 87.5 through 108.0MHz. However, all units are capable of showing European frequencies which are divided every 50kHz from 87.5 through 108MHz.

J. kHz/MHz Indicator

This indicates the station-frequency units: "kHz" for AM and "MHz" for FM.

K. SIGNAL STRENGTH

Five vertical LEDs make up the SIGNAL STRENGTH indicator. The stronger the incoming signal, the farther to the top the lights will illuminate.

L. SCAN TUNE

These buttons tune the tuner up or down in frequency as indicated by the arrows next to the buttons.

M. SCAN LOCK

When SCAN LOCK is out (not depressed), depressing the SCAN TUNE buttons will change the frequency continuously. Tapping the buttons will select frequencies one step at a time.

When SCAN LOCK is in (depressed), pressing the SCAN TUNE buttons will scan and stop at each station strong enough to exceed the scan level threshold.

N. MEMORY Indicator

If the main memory program switch is depressed, the memory programming function for the six Pre Set buttons is activated and indicated by the illuminated amber LED directly above the MEMORY button. It will remain lit for approximately five seconds after the MEMORY button is depressed.

O. PRE SET Indicators

Six green LEDs make up the PRE SET indicator lights. They are located directly above each PRE SET button and illuminate whenever that particular setting is chosen. Only one light will glow at a time.

P. PRE SET Buttons

These buttons may be pre set or programmed to six AM and six FM stations as desired by the user. To

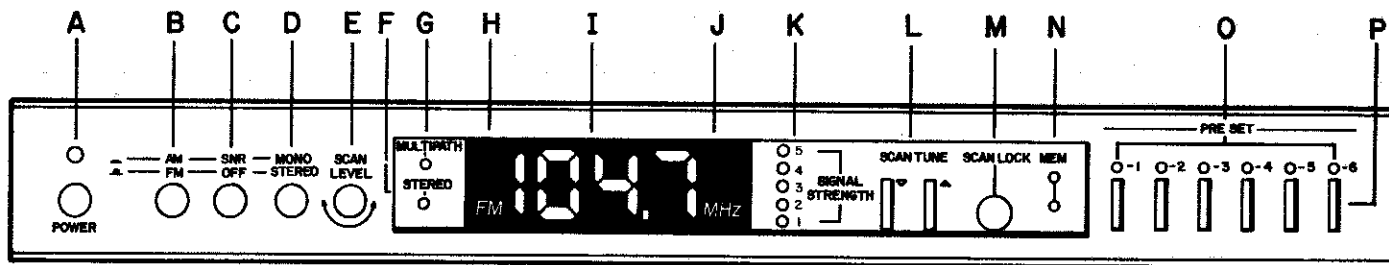


Fig. RVW.1 FM THREE Front View

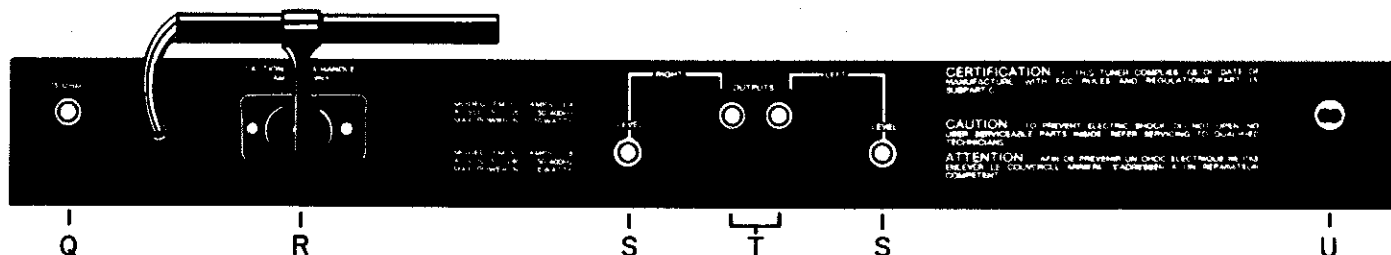


Fig. RVW.2 FM THREE Rear View

program them, first choose the desired station via the SCAN TUNE buttons. Next depress the MEMORY button (N). At that point, the memory function will be activated as indicated by the LED directly above the MEMORY button. Within five seconds, depress the desired PRE SET button to program the memory for that specific frequency. Follow this procedure for each of the remaining five PRE SET buttons.

Each time a PRE SET button is pressed, that particular station will be chosen and a green light above that button will illuminate, indicating that particular PRE SET is currently selected. To change the PRE SET selection, simply follow the original programming instructions and the previously selected station will be erased.

If the FM THREE is turned off, a reserve power supply takes over and maintains the memory PRE SETS for approximately five days. After five days, you must re-program the memory.

Q. FM Antenna Jack

Only one antenna connection jack is provided on the FM THREE: a 75 ohm coaxial type. This type is standard because coaxial cable picks up less noise than conventional twin lead. Also most commercially available FM signals, such as those from local cable TV systems, supply 75 ohm coaxial lead-in and the connector. However, 300 ohm twin lead may be used as antenna lead-in with the FM THREE by using the "balun" supplied with the unit.

R. AM Antenna

An efficient AM loopstick antenna is provided. Position it for best reception. **Caution: Do not use the AM antenna for a handle.**

S. Variable Output Adjustments

These variable adjustments (one for each channel) control the level of the FM THREE output signal. They are used to match the tuner output level to that of other components (turntable, tape deck, etc.) in the sound system.

T. OUTPUT JACKS

The left and right output signals appear at these RCA phono jacks. The output level from these jacks is affected by the variable output adjustments as mentioned before.

U. AC Cord

A standard two-prong plug is supplied on the FM THREE.

V. Operating Precautions

The following is a list of operating precautions to follow when connecting and operating the FM THREE.

1. Operate the tuner from AC mains or not more than 10% above or below the selected line voltage, and only at 50 to 60 Hz, AC. Failure to comply may void the warranty. For conversion to one of five different voltages (100, 120, 200, 220, 240 volts) see Section 6.7.
2. Tampering in the circuitry by unqualified personnel, or making unauthorized modifications to the FM THREE may invalidate the warranty.
3. Never connect more than one antenna system to the FM THREE simultaneously. This procedure may cause severe multipath resulting in highly distorted output.



SECTION 6

ILLUSTRATED PARTS LIST

6.1 General Information

Section 6 contains illustrations and parts lists for the FM THREE. This information should be used with the service, repair and adjustment procedure in Section 7.

Most of the mechanical and structural type parts are illustrated and indexed on exploded view drawings. Electrical and electronic parts on these illustrations are also identified by the circuit schematic designation next to the illustration. Both the index number and the schematic designation are included in the parts list in separate columns. The schematic designations correspond to those shown in schematic diagrams in the Review Section.

Electrical and electronic parts located on printed circuit boards are illustrated by schematic symbols on the trace side and by component shape symbols on the component side. Schematic designations also appear on these diagrams.

The quantity of each part used in each location is also shown in the parts listing.

6.2 Standard and Special Parts

Many electrical and electronic parts used in the FM THREE are standard items stocked by and available from electronic supply houses. However, some electronic parts that appear to be standard, are actually special. A part ordered from Crown will assure an acceptable replacement. Structural items, covers and panels are available from Crown only.

6.3 Ordering Parts

When ordering parts, be sure to give the model and serial number and include the part description and Crown Part Number (CPN) from the parts list. Price quotes are available upon request.

6.4 Shipment

1. Shipment will be made by UPS or best method unless you specify a preferred method.
2. Shipments are made F.O.B. Elkhart, Indiana only.
3. Established Crown accounts will be freight prepaid and billed unless shipped by truck or air freight.
4. All others will be shipped freight collect.

6.5 Terms

NOTE: Part prices are subject to change without notice.

1. Normal terms are C.O.D. unless the order is prepaid.
2. Net 30 days terms apply only to those firms who have an established line of credit with Crown.
3. If prepaying please add an amount for the freight charge. \$2.50 is average for an order under one pound.
4. New parts returned for credit are subject to a 10% restocking charge.
5. You must receive authorization from the Parts Dept. before returning parts for credit.
6. We are not a general parts warehouse! Parts are available for servicing Crown products only.

6.6 Parts Lists, Exploded Views and Schematics

Parts List: Exploded View Drawing

Index No.	Schematic Designation	Description	Crown Part No.	Qty.	Other Information
1		chassis subfront	M20388J0	1	
2		right side chassis	M20385J6	1	
3		back panel	M20386J4	1	
4		left side chassis	M20384J9	1	
5		transformer bracket	M20411J0	1	
6		chassis support bracket	F10615J6	1	
7		hex standoff	C 4882-4	4	
8		output jack	C 4933-5	1	
9		screw #4x.37 self tap	C 4895-6	2	
10		strain relief	C 4896-4	1	
11		antenna base	F10725-4	1	
12		antenna mount	F10726-2	1	
13		screw 6-32x.37	C 4329-6	2	
14		screw 4-40x.75	C 6895-4	1	
15		nut 4-40	C 1938-7	2	
16		rubber grommet	C 6037-3	1	
17		AM antenna	C 6698-2	1	
18		75 ohm antenna jack	C 5207-3	1	
19		lockwasher	C 4822-0	1	
20		solder lug	D 2828-8	1	
21		switch assembly	C 6631-3	1	
22		switch	C 6699-0	1	
23		switch	C 5958-1	1	
24		screw 4-40x.37	C 1844-7	11	
25		lockwasher #4	C 1824-9	5	
26		lockwasher #8	C 2706-7	2	
27		screw 6-32x.375	C 6077-9	17	
28		lockwasher #6	C 5594-4	9	
29		flat fiber washer	C 1296-0	2	
30		screw 6-32x.375	C 6078-7	4	
31		lockwasher #6 black	C 1823-1	4	
32		screw 6-75	C 2135-9	1	
33		power transformer	C 6196-6	1	
34		level control	C 6680-0	2	
35		front panel gray	F10618J0	1	
		front panel silver	F10642J0	1	
		front panel PFM THREE	F10946J5	1	
36		switch collar gray	F10413-7	6	
		switch collar silver	D 4108-3	6	
		switch collar PFM THREE	F10413-7	6	
37		pushbutton	D 6013-3	5	
38		left side bezel gray	M20423J5	1	
		left side bezel silver	M20422J7	1	
		left side bezel PFM-THREE	M20494J6	1	
39		display lens	D 6197-4	1	
40		right side bezel gray	M20420J1	1	
		right side bezel silver	M20421J9	1	
		right side bezel PFM-THREE	M20495J3	1	
41		end cap gray	M20352J6	2	
		end cap silver	M20349J2	2	
		end cap PFM THREE	M20490J4	2	
42		screw 10-32x.50	C 5944-1	4	
43		washer #10	C 2279-5	4	
44		bezel mount bracket	F10720J4	2	
45		screw 6-32x.151	D 6351-7	2	
46		knob	D 6228-7	1	
47		power cord	C 6409-3	1	
not shown		covers, top & bottom	F10617K9	2	
not shown		screws for covers 6-32x.37	C 4329-6	10	

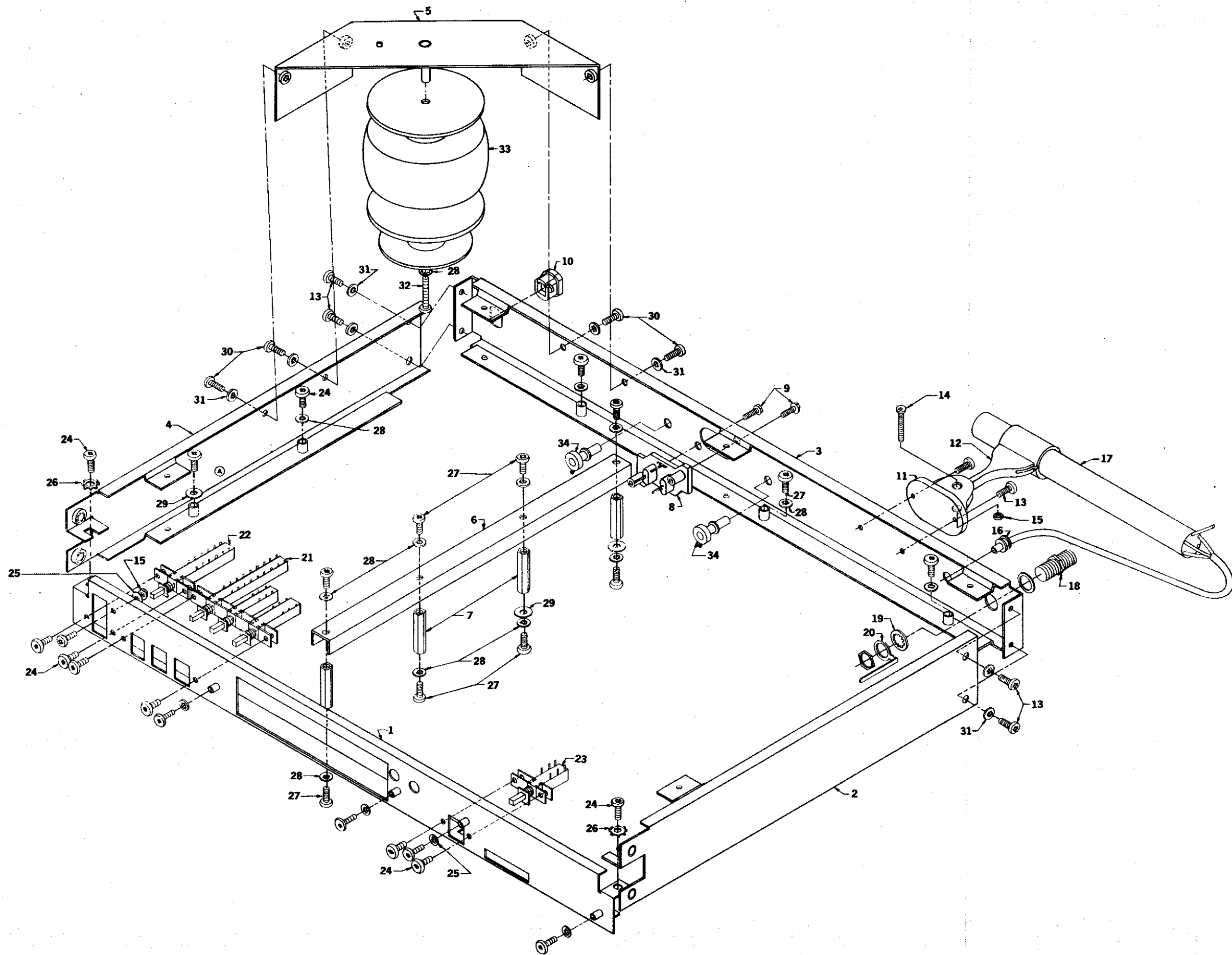


Fig. 6.1 FM THREE Exploded View Drawing

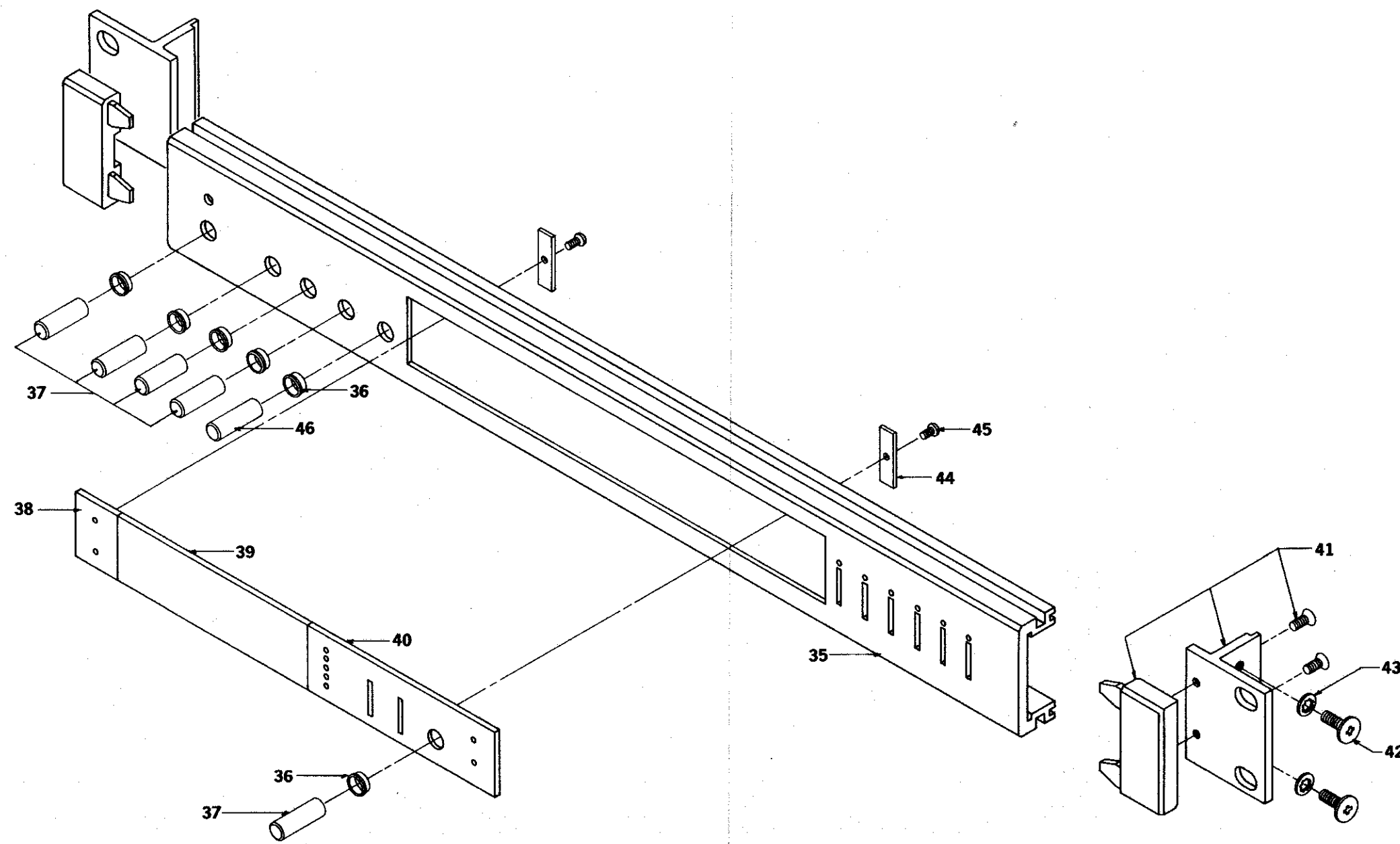


Fig. 6.2 FM THREE Exploded View Drawing
Front Panel

Parts List: Main Module Q42606-6 (for serial numbers 45402 and below)

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
Capacitors			C209	.02mF 50V disc	C 5230-5
C1	100mF 16V	C 3629-8	C210	.02mF 50V disc	C 5230-5
C2	2.2mF 50V	C 5362-6	C211	220mF 16V	C 3796-7
C3	22mF NP 50V	C 5311-3	C212	.02mF 50V disc	C 5230-5
C6	100mF 16V	C 3729-8	C213	.02mF 50V disc	C 5230-5
C7	100mF 16V	C 3729-8	C214	.02mF 50V disc	C 5230-5
C8	100mF 16V	C 3729-8	C215	.02mF 50V disc	C 5230-5
C9	.02mF 50V disc	C 5230-5	C216	.02mF 50V disc	C 5230-5
C100	.1mF	C 6130-6	C217	47pF	C 3409-7
C102	330pF 3000V disc	C 6705-5	C218	.02mF 50V disc	C 5230-5
C103	.02mF 50V disc	C 5230-5	C219	47mF 50V	C 5219-8
C104	.02mF 50V disc	C 5230-5	C220	.02mF	C 5230-5
C105	.001mF	C 2288-6	C221	.47mF 50V	C 6095-1
C106	.02mF 50V disc	C 5230-5	C222	.02mF 50V disc	C 5230-5
C107	.02mF 50V disc	C 5230-5	C223	1mF 35V	C 5638-9
C108	.02mF 50V disc	C 5230-5	C224	1mF 35V	C 5638-9
C109	.02mF 50V disc	C 5230-5	C225	.02mF 50V disc	C 5230-5
C110	2.2pF	C 5190-1	C226	.02mF 50V disc	C 5230-5
C111	.001mF	C 2288-6	C227	.02mF 50V disc	C 5230-5
C112	variable capacitor 3-12pF	C 5162-0	C228	.02mF 50V disc	C 5230-5
C113	.02mF 50V disc	C 5230-5	C229	.001mF disc	C 2288-6
C114	variable capacitor 3-12pF	C 5162-0	C230	.02mF 50V disc	C 5230-5
C115	5pF	C 6691-7	C231	.02mF 50V disc	C 5230-5
C116	.02mF 50V disc	C 5230-5	C232	.02mF 50V disc	C 5230-5
C117	3.3pF	C 6692-5	C233	.02mF 50V disc	C 5230-5
C118	.02mF 50V disc	C 5230-5	C234	5pF	C 6691-7
C119	220pF	C 6689-1	C235	10pF	C 5188-5
C120	.047mF	C 6708-9	C236	.33mF	C 5980-5
C121	8.2pF	C 5191-9	C237	.02mF 50V disc	C 5230-5
C122	.02mF 50V disc	C 5230-5	C239	82pF	C 3627-4
C123	variable capacitor 3-12pF	C 5162-0	C240	.02mF 50V disc	C 5230-5
C124	10pF	C 5188-5	C241	39pF	C 3627-4
C125	15pF	C 5272-7	C242	.02mF 50V disc	C 5230-5
C126	3.3pF	C 6692-5	C243	470mF 35V	C 4477-3
C127	.02mF 50V disc	C 5230-5	C244	47mF 50V	C 5219-8
C128	10pF	C 5188-5	C245	10pF	C 5188-5
C129	5pF	C 6691-7	C246	.001mF	C 2288-6
C130	22pF	C 6688-3	C247	.001mF	C 2288-6
C131	.02mF 50V disc	C 5230-5	C248	10mF 50V	C 3728-0
C132	.02mF 50V disc	C 5230-5	C249	.22mF 50V	C 6678-4
C133	variable capacitor 3-12pF	C 5162-0	C250	.033mF 100V	C 6671-9
C134	.047mF	C 6708-9	C251	.047mF	C 6708-9
C135	2.2pF	C 5190-1	C252	.02mF 50V disc	C 5230-5
C136	.001mF disc	C 2288-6	C253	.02mF 50V disc	C 5230-5
C200	.02mF 50V disc	C 5230-5	C254	.02mF 50V disc	C 5230-5
C201	.02mF 50V disc	C 5230-5	C255	.02mF 50V disc	C 5230-5
C202	.02mF 50V disc	C 5230-5	C256	.033mF 100V	C 6671-9
C203	.02mF 50V disc	C 5230-5	C300	33mF 50V	C 3729-8
C205	.02mF 50V disc	C 5230-5	C301	3.3mF 50V	C 6096-9
C206	.02mF 50V disc	C 5230-5	C302	47mF 50V	C 5219-8
C207	.02mF 50V disc	C 5230-5	C303	47mF 50V	C 5219-8
C208	47mF 50V	C 5219-8	C304	.02mF 50V disc	C 5230-5
			C305	100mF 16V	C 3729-8

Parts List: Main Module Q42606-6 (for serial numbers 45402 and below) Contd

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
R7	10K ohms	C 2631-7	R206	390 ohms	C 6495-3
R8	50K trimpot	C 6681-8	R207	680 ohms	C 5975-5
R9	50K trimpot	C 6681-8	R208	47 ohms	C 1011-3
R10	1K ohms	C 2627-5	R209	10 ohms	C 3753-8
R11	1K ohms	C 2627-5	R210	390 ohms	C 6495-3
R12	10K ohms	C 2631-7	R211	390 ohms	C 6495-3
R13	10K ohms	C 2631-7	R212	100 ohms	C 2872-7
R14	3.3K ohms	C 2629-1	R213	10 ohms	C 3753-8
R15	100K ohms	C 2883-4	R214	2.2K ohms	C 2628-5
R16	47K ohms	C 2880-0	R216	470K ohms	C 4225-6
R17	15K ohms	C 2632-5	R217	5.6K ohms	C 3220-8
R18	22K ohms	C 3220-8	R218	10K ohms	C 2631-7
R19	47K ohms	C 2880-0	R219	51K ohms	C 4814-7
R20	100 ohms	C 2872-7	R221	47K ohms	C 2880-0
R21	15K ohms	C 2632-5	R222	47K ohms	C 2880-0
R23	220K ohms	C 4219-9	R223	3.9K ohms	C 2630-9
R24	100K ohms	C 2883-4	R224	100 ohms	C 2872-7
R26	1K ohms	C 2627-5	R225	100 ohms	C 2872-7
R27	1K ohms	C 2627-5	R226	39K ohms	C 6407-8
R28	100 ohms	C 2872-7	R227	4.7K ohms	C 3939-3
R29	4K ohms	C 4506-9	R228	10 ohms	C 3753-8
R30	470 ohms	C 2626-7	R229	680 ohms	C 5975-5
R100	68K ohms	C 3620-9	R230	270 ohms	C 1071-7
R101	100K ohms	C 2883-4	R231	100K ohms	C 2883-4
R102	100 ohms	C 2872-7	R232	100K ohms	C 2883-4
R103	330 ohms	C 5169-5	R233	100K ohms	C 2883-4
R104	33 ohms	C 3000-4	R234	1K ohm	C 2627-5
R105	100 ohms	C 2872-7	R235	120 ohms	C 4723-0
R106	100K ohms	C 2883-4	R236	82K ohms	C 4212-4
R107	68K ohms	C 3620-9	R237	100K ohms	C 2883-4
R108	68K ohms	C 3620-9	R238	5.1K ohms	C 5163-8
R109	100K ohms	C 2883-4	R239	220 ohms	C 5047-3
R110	100 ohms	C 2872-7	R240	47 ohms	C 1011-3
R111	47K ohms	C 2880-0	R241	1.8K ohms	C 3807-2
R112	100 ohms	C 2872-7	R242	4.3K ohms	C 4855-0
R113	8.2K ohms	C 2877-6	R243	1.6K ohms	C 3873-4
R114	10K ohms	C 2631-7	R244	1K ohms	C 2627-5
R115	1.5K ohms	C 2876-8	R245	1K ohms	C 2627-5
R116	2.2K ohms	C 2628-5	R246	10K ohms	C 2631-7
R117	1K ohms	C 2627-5	R247	10K ohms	C 2631-7
R118	10K ohms	C 2631-7	R248	330 ohms	C 5169-5
R119	6.8K ohms	C 5166-1	R249	220K ohms	C 4219-9
R120	100K ohms	C 2883-4	R250	1K ohms	C 2627-5
R121	100 ohms	C 2872-7	R251	100 ohms	C 2872-7
R122	100 ohms	C 2872-7	R252	82K ohms	C 4212-4
R123	100K ohms	C 2883-4	R253	10K ohms	C 2631-7
R200	3.3K ohms	C 2629-1	R254	470 ohms	C 2626-7
R201	330 ohms	C 5169-5	R255	250K trim pot	C 3028-5
R202	240 ohms	C 4513-5	R256	10 ohms	C 3753-8
R203	10 ohms	C 3753-8	R300	220K ohms	C 4219-9
R204	390 ohms	C 6495-3	R301	100K ohms	C 2883-4
R205	10 ohms	C 3753-8	R302	100K ohms	C 2883-4

Parts List: Main Module Q42606-6 (for serial numbers 45402 and below) Contd

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
R303	10K ohms	C 2631-7	R413	10K ohms	C 2631-7
R304	8.2K ohms	C 2877-6	R414	10K ohms	C 2631-7
R305	10K ohms	C 2631-7	R415	1K ohms	C 2627-5
R306	47 ohms	C 1011-3	R416	1K ohms	C 2627-5
R307	10K ohms	C 2631-7	R417	8.2K ohms	C 2877-6
R308	10K ohms	C 2631-7	R418	1K ohms	C 2627-5
R309	10K ohms	C 2631-7	R419	10K ohms	C 2631-7
R310	150K ohms	C 4216-5	R420	15K ohms	C 2632-5
R311	150K ohms	C 4216-5	R421	10K ohms	C 2631-7
R312	3.3K ohms	C 2629-1	R422	10K ohms	C 2631-7
R313	3.3K ohms	C 2629-1	R423	18K ohms	C 2633-3
R314	3.3K ohms	C 2629-1	R424	40K ohms log pot	C 6680-0
R315	3.3K ohms	C 2629-1	R425	1K ohms	C 2627-5
R316	10 ohms	C 3753-8	R426	620 ohms	C 3872-6
R317	10 ohms	C 3753-8	R427	4.7K ohms	C 3939-3
R318	47 ohms	C 1011-3	R428	330K ohms	C 4222-3
R319	10K trim pot	C 5947-4	R429	100K ohms	C 2883-4
R320	15K ohms	C 2632-5	R430	220K ohms	C 4219-9
R321	10K trim pot	C 5947-4	R500	47K ohms	C 2880-0
R322	15K ohms	C 2632-5	R501	4.7K ohms	C 3939-3
R323	22K ohms	C 3220-8	R502	150K ohms	C 4216-5
R324	22K ohms	C 3220-8	R503	27K ohms	C 5165-3
R325	4.7K ohms	C 3939-3	R504	3.3K ohms	C 2629-1
R326	4.7K ohms	C 3939-3	R505	100 ohms	C 2872-7
R327	5.1K ohms	C 5163-8	R506	1K ohms	C 2627-5
R328	5.1K ohms	C 5163-8	R507	10K ohms	C 2631-7
R329	68K ohms	C 3620-9	R508	20K ohms	C 5046-5
R330	68K ohms	C 3620-9	R509	10K ohms	C 2631-7
R331	18K ohms	C 2633-3	R510	15K ohms	C 2632-5
R332	10K trim pot	C 5947-4	R511	56K ohms	C 2882-6
R333	100K trim pot	C 1713-4	R512	68K ohms	C 3620-9
R334	22K ohms	C 3220-8	R513	10K ohms	C 2631-7
R335	30K ohms	C 5270-1	R514	10K ohms	C 2631-7
R336	8.2K ohms	C 2877-6	R515	1K ohms	C 2627-5
R337	39K ohms	C 6407-8	R516	1K ohms	C 2627-5
R338	10K ohms	C 2631-7	R517	8.2K ohms	C 2877-6
R339	33K ohms	C 4346-0	R518	1K ohms	C 2627-5
R340	10K ohms	C 2631-7	R519	10K ohms	C 2631-7
R341	10 ohms	C 3753-8	R520	15K ohms	C 2632-5
R400	47K ohms	C 2880-0	R521	10K ohms	C 2631-7
R401	4.7K ohms	C 3939-3	R522	10K ohms	C 2631-7
R402	150K ohms	C 4216-5	R523	18K ohms	C 2633-3
R403	27K ohms	C 5165-3	R524	40K ohms log pot	C 6680-0
R404	3.3K ohms	C 2629-1	R525	1K ohms	C 2627-5
R405	100 ohms	C 2872-7	R526	620 ohms	C 3872-6
R406	1K ohms	C 2627-5	R527	4.7K ohms	C 3939-3
R407	10K ohms	C 2631-7	R528	330K ohms	C 4222-3
R408	20K ohms	C 5046-5	R529	100K ohms	C 2883-4
R409	10K ohms	C 2631-7	R530	220K ohms	C 4219-9
R410	15K ohms	C 2632-5	R600	100K ohms	C 2883-4
R411	56K ohms	C 2882-6	R601	100K ohms	C 2883-4
R412	68K ohms	C 3620-9	R602	10K ohms	C 2631-7

Parts List: Main Module Q42606-6 (for serial numbers 45402 and below) Contd

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
D703	1N4148 diode	C 3181-2	Q600	2N3704	C 6588-5
D704	1N4148 diode	C 3181-2	Q601	J310 JFET	C 6049-8
D705	1N4148 diode	C 3181-2	Q700	2N3704	C 6588-5
D800	1N4004 diode	C 2851-1	Q701	2N3704	C 6588-5
D801	1N4004 diode	C 2851-1	Q702	MPSA18	D 2962-5
D802	1N4004 diode	C 2851-1	Q703	2N3704	C 6588-5
D803	1N4004 diode	C 2851-1	Q704	2N3704	C 6588-5
D804	1N4004 diode	C 2851-1	Q705	2N3704	C 6588-5
D807	1N4148 diode	C 3181-2	Q706	2N3704	C 6588-5
D808	1N4148 diode	C 3181-2	Q707	J177 JFET	C 6584-4
D809	6.2V zener diode 1N4735	C 6578-6	Q800	2N3704	C 6588-5
D810	6.2V zener diode 1N4735	C 6578-6	Q801	UA7812CKC 12V regulator	C 5667-8
D812	1N4735 6.2 zener diode	C 6578-6	Q802	2N3704	C 6588-5
D813	1N4004 diode	C 2851-1	Q803	2N3702	C 6587-7
V101	varactor diode BB304	C 6590-1	Integrated Circuits		
V102	varactor diode BB304	C 6590-1	U1	TL074	C 4696-8
V103	varactor diode BB304	C 6590-1	U2	TL0742	C 4696-8
V104	varactor diode BB304	C 6590-1	U3	LM13600	C 6628-9
V105	varactor diode BB304	C 6590-1	U200	TA7060	C 6624-8
V200	varactor diode BB409	C 6937-4	U201	TA7060	C 6624-8
V600	varactor diode BB112	C 6589-3	U202	LA1235	C 6620-6
V601	varactor diode BB112	C 6589-3	U203	TL074	C 4696-8
V602	varactor diode BB112	C 6589-3	U300	MC34002	C 6300-5
Transistors			U301	LA3381	C 6619-8
Q1	2N3704	C 6588-5	U600	LA1245	C 6618-0
Q2	2N3704	C 6588-5	U700	TD6104	C 6622-2
Q3	2N3704	C 6588-5	U701	TC9137P	C 6623-0
Q4	2N3704	C 6588-5	U702	TD6301	C 6621-4
Q5	2N3704	C 6588-5	U800	TL072	C 5070-5
Q100	J310 JFET	C 6049-8	Inductors		
Q101	J310 JFET	C 6049-8	B200	ferrite bead	C 6709-7
Q102	BF982	C 6585-1	B700	ferrite bead	C 6709-7
Q103	2N5770	C 5135-6	I200	10.7MHz filter	C 4954-1
Q104	2N5770	C 5135-6	I201	10.7MHz filter	C 4954-1
Q105	J310 JFET	C 6049-8	I202	10.7MHz filter	C 4954-1
Q200	J310 JFET	C 6049-8	I203	1.965MHz bandpass filter	C 5911-0
Q201	BF982	C 6585-1	I300	low pass filter	C 5912-8
Q202	2N3704	C 6588-5	I301	low pass filter	C 6721-2
Q203	2N5770	C 5135-6	I302	low pass filter	C 6721-2
Q204	2N5770	C 5135-6	L100	front end coil, green	D 5760A8
Q205	2N3704	C 6588-5	L101	22uH inductor	C 6574-5
Q206	2N3704	C 6588-5	L102	12 turn coil	H42682-7
Q207	2N3704	C 6588-5	L103	12uH inductor	C 6573-7
Q400	2N3702	C 6587-7	L104	front end coil, blue	D 5762-6
Q401	2N3704	C 6588-5	L105	front end coil, green	D 5760A8
Q402	2N3704	C 6588-5	L106	22uH inductor	C 6574-5
Q403	J177 JFET	C 6584-4	L107	1uH inductor	C 6571-1
Q500	2N3702	C 6587-7	L108	36 turn coil	D 6177-6
Q501	2N3704	C 6588-5	L109	15 turn coil	D 6178-4
Q502	2N3704	C 6588-5	L110	22uH inductor	C 6574-5
Q503	J177 JFET	C 6584-4			

Parts List: Main Module Q42606-6 (for serial numbers 45402 and below) Contd

Schematic Designation	Description	Crown Part No.
L111	front end coil, yellow	D 5820-2
L112	22uH inductor	C 6574-5
L113	22uH inductor	C 6574-5
L114	front end coil, orange	D 6170-1
L200	22uH inductor	C 6574-5
L201	33uH inductor	C 5644-7
L202	detector coil	D 6296-4
L203	22uH inductor	D 5122-3
L204	12uH inductor	C 6573-7
L205	22uH inductor	D 5122-3
L206	22uH inductor	D 5122-3
L300	15mH adjustable coil	D 6225-3
L600	2.2uH	C 6572-9
L601	AM oscillator coil	C 6693-3
L602	AM coil	C 6694-1
L700	22uH inductor	C 6574-5
L701	12uH inductor	C 6573-7
T601	AM RF coil	D 6172-7
T602	AM IF coil	C 6695-8
Y200	12.665MHz crystal	C 5950-8
Y600	BFU450 narrow band resonator	C 6592-7
Y700	7.2MHz crystal	D 6375-6

Miscellaneous

	FM THREE main PC board	D 6251C2
	PC board snap in jack	C 6312-0
	6-32x.375 phillips rd. head screw	C 6077-9
	20 pin DIL IC socket	C 5647-0
	#6 starwasher	C 5594-4
	T0220 heatsink	C 5341-0
	3 pin socket	C 5295-8
	6-32x1 standoff	C 4882-4
	375x141x031 fiber washer	C 1296-0
S6a	DPDT switch	C 5080-4
S6b	DPDT switch	C 5080-4
S300	DPDT switch	C 5080-4

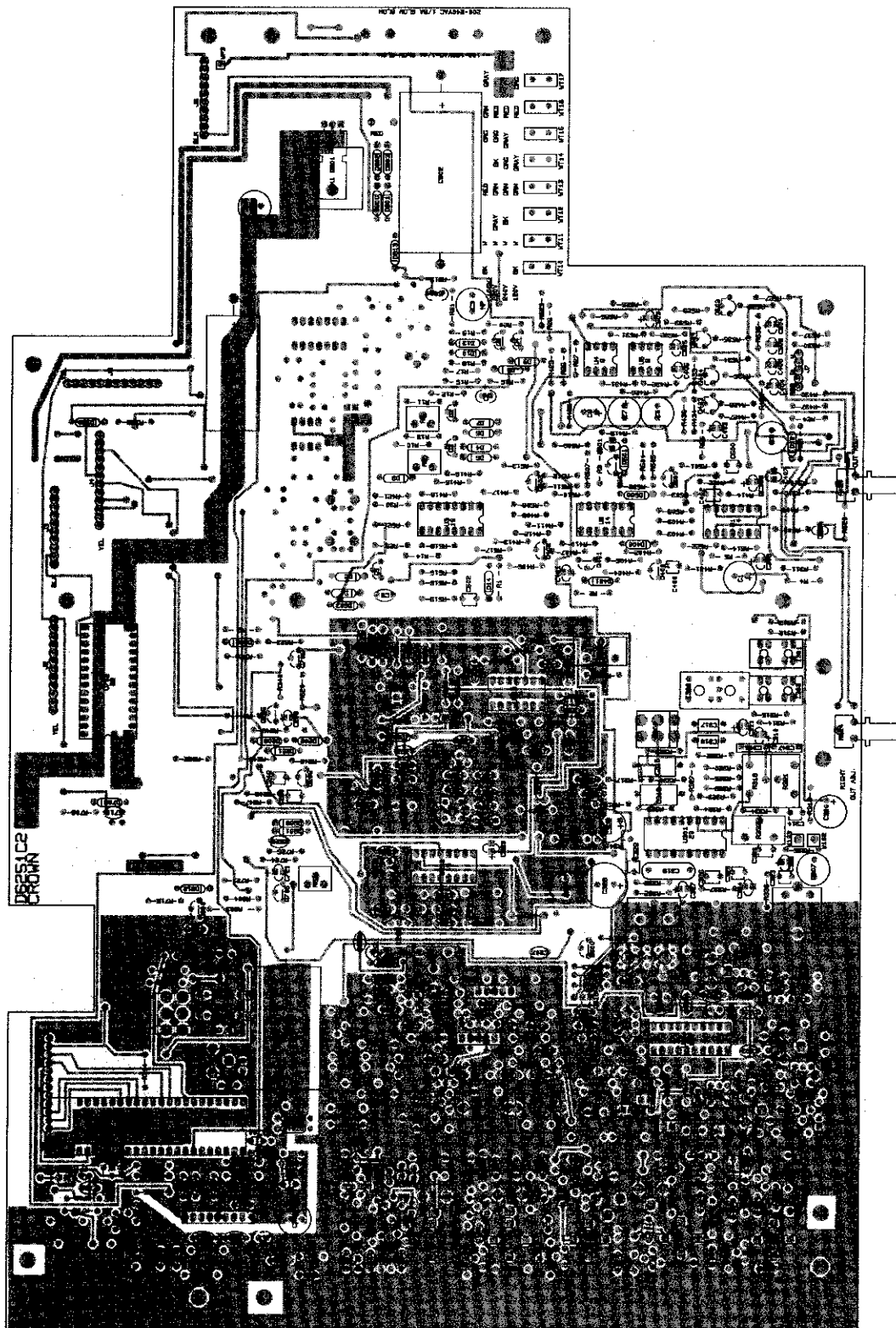


Fig. 6.4 Main Module Component Board Layout #Q42542-3
 (for serial numbers 45601 and above)

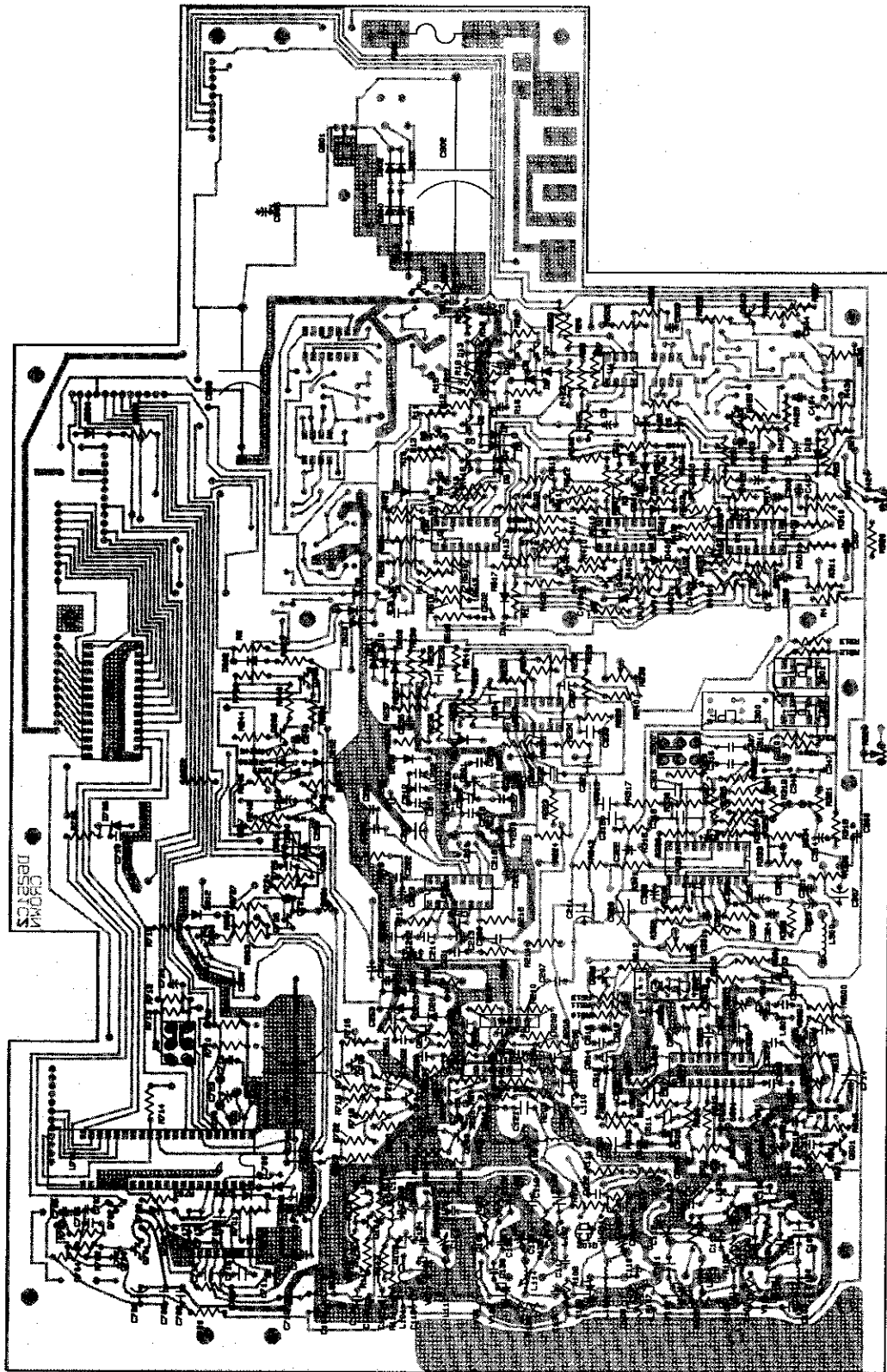


Fig. 6.5 Main Module Foil Board Layout #Q42542-3
(for serial numbers 45601 and above)

Parts List: Main Module Q42542-3 (for serial numbers 45601 and above)

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
Capacitors			C209	.02mF 50V disc	C 5230-5
C1	100mF 16V	C 3629-8	C210	.02mF 50V disc	C 5230-5
C2	2.2mF 50V	C 5362-6	C211	220mF 16V	C 3796-7
C3	22mF NP 50V	C 5311-3	C212	.02mF 50V disc	C 5230-5
C6	100mF 16V	C 3729-8	C213	.02mF 50V disc	C 5230-5
C7	100mF 16V	C 3729-8	C214	.02mF 50V disc	C 5230-5
C8	100mF 16V	C 3729-8	C215	.02mF 50V disc	C 5230-5
C9	.02mF 50V disc	C 5230-5	C216	.02mF 50V disc	C 5230-5
C100	.1mF	C 6130-6	C217	20pF chip capacitor	C 6943-2
C102	330pF 3000V disc	C 6705-5	C218	.02mF 50V disc	C 5230-5
C103	.02mF 50V disc	C 5230-5	C219	330pF 50V	C 6939-0
C104	.02mF 50V disc	C 5230-5	C220	3.3mF 50V	C 6096-9
C105	.001mF	C 2288-6	C221	.02mF 50V disc	C 5230-5
C106	.02mF 50V disc	C 5230-5	C222	.02mF 50V disc	C 5230-5
C107	.02mF 50V disc	C 5230-5	C223	1mF 35V	C 5638-9
C108	.02mF 50V disc	C 5230-5	C225	.02mF 50V disc	C 5230-5
C109	.02mF 50V disc	C 5230-5	C226	39pF	C 6940-8
C110	2.2pF	C 5190-1	C227	18pF	C 6941-6
C111	.001mF	C 2288-6	C228	.02mF 50V disc	C 5230-5
C112	variable capacitor 3-12pF	C 5162-0	C229	130pF chip capacitor	C 6942-4
C113	.02mF 50V disc	C 5230-5	C230	82pF mica	C 3627-4
C114	variable capacitor 3-12pF	C 5162-0	C231	.02mF 50V disc	C 5230-5
C115	5pF	C 6691-7	C232	.1mF	C 6130-6
C116	.02mF 50V disc	C 5230-5	C 233	.01mF	C 1751-4
C117	3.3pF	C 6692-5	C234	.01mF	C 1751-4
C118	.02mF 50V disc	C 5230-5	C235	10mF 50V	C 3728-0
C119	220pF	C 6689-1	C236	.39mF	C 6891-3
C120	.047mF	C 6708-9	C237	.39mF	C 6891-3
C121	8.2pF	C 5191-9	C248	10mF 50V	C 3728-0
C122	.02mF 50V disc	C 5230-5	C249	.22mF 50V	C 6678-4
C123	variable capacitor 3-12pF	C 5162-0	C250	.033mF 100V	C 6671-9
C124	10pF	C 5188-5	C251	.047mF	C 6708-9
C125	15pF	C 5272-7	C252	.02mF 50V disc	C 5230-5
C126	3.3pF	C 6692-5	C253	.02mF 50V disc	C 5230-5
C127	.02mF 50V disc	C 5230-5	C254	.02mF 50V disc	C 5230-5
C128	10pF	C 5188-5	C255	.02mF 50V disc	C 5230-5
C129	5pF	C 6691-7	C256	.033mF 100V	C 6671-9
C130	22pF	C 6688-3	C257	selected	
C131	.02mF 50V disc	C 5230-5	C300	33mF 50V	C 3729-8
C132	.02mF 50V disc	C 5230-5	C308	10mF 50V	C 3728-0
C133	variable capacitor 3-12pF	C 5162-0	C309	10mF 50V	C 3728-0
C134	.047mF	C 6708-9	C310	10mF 50V	C 3728-0
C135	2.2pF	C 5190-1	C311	10mF 50V	C 3728-0
C200	.02mF 50V disc	C 5230-5	C312	.01mF	C 1751-4
C201	.02mF 50V disc	C 5230-5	C313	.01mF	C 1751-4
C202	.02mF 50V disc	C 5230-5	C314	3300pF 50V	C 6884-2
C203	.02mF 50V disc	C 5230-5	C315	750pF	C 6704-8
C204	.02mF 50V disc	C 5230-5	C316	270pF 5%	C 6231-2
C205	.02mF 50V disc	C 5230-5	C317	270pF 5%	C 6231-2
C206	.02mF 50V disc	C 5230-5	C318	750pF	C 6704-8
C207	.02mF 50V disc	C 5230-5	C319	680pF	C 6580-2
			C320	.033mF 100V	C 6671-9

Parts List: Main Module Q42542-3 (for serial numbers 45601 and above) Contd

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
R26	1K ohms	C 2627-5	R224	68K ohms	C 3620-9
R27	1K ohms	C 2627-5	R225	68K ohms	C 3620-9
R28	100 ohms	C 2872-7	R226	47K ohms	C 2880-0
R29	4K ohms	C 4506-9	R227	33K ohms	C 4346-0
R30	470 ohms	C 2626-7	R228	56K ohms	C 2882-6
R100	68K ohms	C 3620-9	R229	1M ohms	C 3198-6
R101	100K ohms	C 2883-4	R230	56K ohms	C 2882-6
R102	100 ohms	C 2872-7	R231	1M ohms	C 3198-6
R103	330 ohms	C 5169-5	R232	56K ohms	C 2882-6
R104	33 ohms	C 3000-4	R233	1M ohms	C 3198-6
R105	100 ohms	C 2872-7	R234	56K ohms	C 2882-6
R106	100K ohms	C 2883-4	R235	1M ohms	C 3198-6
R107	68K ohms	C 3620-9	R236	110K ohms	C 4213-2
R108	68K ohms	C 3620-9	R237	100K ohms	C 2883-4
R109	100K ohms	C 2883-4	R238	330K ohms	C 4222-3
R110	100 ohms	C 2872-7	R239	500K trim pot	C 5209-9
R111	47K ohms	C 2880-0	R240	180K ohms	C 4218-1
R112	100 ohms	C 2872-7	R241	180K ohms	C 4218-1
R113	8.2K ohms	C 2877-6	R242	330K ohms	C 4222-3
R114	10K ohms	C 2631-7	R243	10 ohms	C 3753-8
R115	1.5K ohms	C 2876-8	R244	1K ohms	C 2627-5
R116	2.2K ohms	C 2628-5	R245	1K ohms	C 2627-5
R117	1K ohms	C 2627-5	R246	10K ohms	C 2631-7
R118	10K ohms	C 2631-7	R247	10K ohms	C 2631-7
R119	6.8K ohms	C 5166-1	R248	330 ohms	C 5169-5
R120	100K ohms	C 2883-4	R249	220K ohms	C 4219-9
R121	100 ohms	C 2872-7	R250	1K ohms	C 2627-5
R122	100 ohms	C 2872-7	R251	100 ohms	C 2872-7
R123	100K ohms	C 2883-4	R252	82K ohms	C 4212-4
R200	3.3K ohms	C 2629-1	R253	10K ohms	C 2631-7
R201	330 ohms	C 5169-5	R254	470 ohms	C 2626-7
R202	240 ohms	C 4513-5	R255	250K trim pot	C 3028-5
R203	10 ohms	C 3753-8	R256	10 ohms	C 3753-8
R204	390 ohms	C 6495-3	R310	150K ohms	C 4216-5
R205	10 ohms	C 3753-8	R311	150K ohms	C 4216-5
R206	390 ohms	C 6495-3	R312	3.3K ohms	C 2629-1
R207	680 ohms	C 5975-5	R313	3.3K ohms	C 2629-1
R208	47 ohms	C 1011-3	R314	3.3K ohms	C 2629-1
R209	10 ohms	C 3753-8	R315	3.3K ohms	C 2629-1
R210	390 ohms	C 6495-3	R316	10 ohms	C 3753-8
R211	390 ohms	C 6495-3	R317	10 ohms	C 3753-8
R212	100 ohms	C 2872-7	R318	47 ohms	C 1011-3
R213	10 ohms	C 3753-8	R319	10K trim pot	C 5947-4
R214	2.2K ohms	C 2628-5	R320	15K ohms	C 2632-5
R216	33K ohms	C 4346-0	R321	10K trim pot	C 5947-4
R217	47K ohms	C 2880-0	R322	15K ohms	C 2632-5
R218	68K ohms	C 3620-9	R323	22K ohms	C 3220-8
R219	47K ohms chip resistor	C 6946-5	R324	22K ohms	C 3220-8
R220	10K ohms chip resistor	C 6945-7	R325	4.7K ohms	C 3939-3
R221	1K ohms chip resistor	C 6944-0	R326	4.7K ohms	C 3939-3
R222	5.6K ohms	C 3220-8	R327	5.1K ohms	C 5163-8
R223	68K ohms	C 3620-9	R328	5.1K ohms	C 5163-8

Parts List: Main Module Q42542-3 (for serial numbers 45601 and above) Contd

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
R329	68K ohms	C 3620-9	R508	20K ohms	C 5046-5
R330	68K ohms	C 3620-9	R509	10K ohms	C 2631-7
R331	18K ohms	C 2633-3	R510	15K ohms	C 2632-5
R332	10K trim pot	C 5947-4	R511	56K ohms	C 2882-6
R333	100K trim pot	C 1713-4	R512	68K ohms	C 3620-9
R334	22K ohms	C 3220-8	R513	10K ohms	C 2631-7
R335	30K ohms	C 5270-1	R514	10K ohms	C 2631-7
R336	8.2K ohms	C 2877-6	R515	1K ohms	C 2627-5
R337	39K ohms	C 6407-8	R516	1K ohms	C 2627-5
R338	10K ohms	C 2631-7	R517	8.2K ohms	C 2877-6
R339	33K ohms	C 4346-0	R518	1K ohms	C 2627-5
R340	10K ohms	C 2631-7	R519	10K ohms	C 2631-7
R341	10 ohms	C 3753-8	R520	15K ohms	C 2632-5
R400	47K ohms	C 2880-0	R521	10K ohms	C 2631-7
R401	4.7K ohms	C 3939-3	R522	10K ohms	C 2631-7
R402	150K ohms	C 4216-5	R523	18K ohms	C 2633-3
R403	27K ohms	C 5165-3	R524	40K ohms log pot	C 6680-0
R404	3.3K ohms	C 2629-1	R525	1K ohms	C 2627-5
R405	100 ohms	C 2872-7	R526	620 ohms	C 3872-6
R406	1K ohms	C 2627-5	R527	4.7K ohms	C 3939-3
R407	10K ohms	C 2631-7	R528	330K ohms	C 4222-3
R408	20K ohms	C 5046-5	R529	100K ohms	C 2883-4
R409	10K ohms	C 2631-7	R530	220K ohms	C 4219-9
R410	15K ohms	C 2632-5	R600	100K ohms	C 2883-4
R411	56K ohms	C 2882-6	R601	100K ohms	C 2883-4
R412	68K ohms	C 3620-9	R602	10K ohms	C 2631-7
R413	10K ohms	C 2631-7	R603	82 ohms	C 3960-9
R414	10K ohms	C 2631-7	R604	10 ohms	C 3753-8
R415	1K ohms	C 2627-5	R605	100 ohms	C 2872-7
R416	1K ohms	C 2627-5	R606	10K ohms	C 2631-7
R417	8.2K ohms	C 2877-6	R607	1K ohms	C 2627-5
R418	1K ohms	C 2627-5	R608	3.3K ohms	C 2629-1
R419	10K ohms	C 2631-7	R609	470 ohms	C 2626-7
R420	15K ohms	C 2632-5	R610	150K ohms	C 4216-5
R421	10K ohms	C 2631-7	R611	33K ohms	C 4346-0
R422	10K ohms	C 2631-7	R612	1K ohms	C 2627-5
R423	18K ohms	C 2633-3	R613	1K ohms	C 2627-5
R424	40K ohms log pot	C 6680-0	R614	15 ohms	C 3614-2
R425	1K ohms	C 2627-5	R615	220 ohms	C 5047-3
R426	620 ohms	C 3872-6	R616	220 ohms	C 5047-3
R427	4.7K ohms	C 3939-3	R617	100K ohms	C 2883-4
R428	330K ohms	C 4222-3	R618	1.5K ohms	C 2876-8
R429	100K ohms	C 2883-4	R619	100 ohms	C 2872-7
R430	220K ohms	C 4219-9	R620	10K ohms	C 2631-7
R500	47K ohms	C 2880-0	R621	20K trim pot	C 6633-9
R501	4.7K ohms	C 3939-3	R622	15K ohms	C 2632-5
R502	150K ohms	C 4216-5	R623	10K ohms	C 2631-7
R503	27K ohms	C 5165-3	R700	1K ohms	C 2627-5
R504	3.3K ohms	C 2629-1	R702	8.2K ohms	C 2877-6
R505	100 ohms	C 2872-7	R703	3K ohms	C 3805-6
R506	1K ohms	C 2627-5	R704	10K ohms	C 2631-7
R507	10K ohms	C 2631-7	R705	22K ohms	C 3220-8

Parts List: Main Module Q42542-3 (for serial numbers 45601 and above) Contd

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
R706	1K ohms	C 2627-5	D300	1N4148 diode	C 3181-2
R707	33K ohms	C 4346-0	D400	1N4148 diode	C 3181-2
R708	10K ohms	C 2631-7	D401	1N4148 diode	C 3181-2
R709	10K ohms	C 2631-7	D500	1N4148 diode	C 3181-2
R710	10K ohms	C 2631-7	D501	1N4148 diode	C 3181-2
R713	150K ohms	C 4216-5	D600	1N4148 diode	C 3181-2
R714	1.8K ohms	C 3807-2	D602	1N60 diode	C 6575-2
R715	10K ohms	C 2631-7	D603	1N4148 diode	C 3181-2
R716	10K ohms	C 2631-7	D700	1N4148 diode	C 3181-2
R717	10K ohms	C 2631-7	D701	1N4148 diode	C 3181-2
R718	10K ohms	C 2631-7	D702	1N4148 diode	C 3181-2
R719	10K ohms	C 2631-7	D704	1N4158 diode	C 3181-2
R720	22K ohms	C 3220-8	D705	1N4158 diode	C 3181-2
R721	100 ohms	C 2872-7	D706	1N4158 diode	C 3181-2
R722	10K ohms	C 2631-7	D707	1N4158 diode	C 3181-2
R723	22K ohms	C 3220-8	D800	1N4004 diode	C 2851-1
R724	22K ohms	C 3220-8	D801	1N4004 diode	C 2851-1
R725	10K ohms	C 2631-7	D802	1N4004 diode	C 2851-1
R726	1K ohms	C 2627-5	D803	1N4004 diode	C 2851-1
R727	47K ohms	C 2880-0	D812	1N4735 6.2 zener diode	C 6578-6
R803	270 ohms .5W	C 1071-7	D813	1N4004 diode	C 2851-1
R804	1.5K ohms	C 2876-8	V101	varactor diode BB304	C 6590-1
R805	680 ohms	C 5975-5	V102	varactor diode BB304	C 6590-1
R819	330K ohms	C 4222-3	V103	varactor diode BB304	C 6590-1
Diodes			V104	varactor diode BB304	C 6590-1
D1	1N4148 diode	C 3181-2	V105	varactor diode BB304	C 6590-1
D2	1N4148 diode	C 3181-2	V200	varactor diode BB409	C 6937-4
D3	1N4148 diode	C 3181-2	V600	varactor diode BB112	C 6589-3
D4	1N4148 diode	C 3181-2	V601	varactor diode BB112	C 6589-3
D5	1N4148 diode	C 3181-2	V602	varactor diode BB112	C 6589-3
D6	1N4148 diode	C 3181-2	Transistors		
D7	1N4148 diode	C 3181-2	Q1	2N3704	C 6588-5
D8	1N4148 diode	C 3181-2	Q2	2N3704	C 6588-5
D9	1N4148 diode	C 3181-2	Q3	2N3704	C 6588-5
D10	1N4148 diode	C 3181-2	Q4	2N3704	C 6588-5
D11	1N4148 diode	C 3181-2	Q5	2N3704	C 6588-5
D12	1N4148 diode	C 3181-2	Q100	J310 JFET	C 6049-8
D13	1N4732 4.7 zener diode	C 6577-8	Q101	J310 JFET	C 6049-8
D14	1N4735 zener diode	C 6578-6	Q102	BF982	C 6585-1
D200	1N60 diode	C 6575-2	Q103	2N5770	C 5135-6
D201	1N60 diode	C 6575-2	Q104	2N5770	C 5135-6
D202	1N60 diode	C 6575-2	Q105	J310 JFET	C 6049-8
D203	1N60 diode	C 6575-2	Q200	J310 JFET	C 6049-8
D204	1N60 diode	C 6575-2	Q201	2N5770	C 5135-6
D205	1N4148 diode	C 3181-2	Q205	2N3704	C 6588-5
D206	1N4148 diode	C 3181-2	Q206	2N3704	C 6588-5
D207	1N4148 diode	C 3181-2	Q207	2N3704	C 6588-5
D208	1N4148 diode	C 3181-2	Q400	2N3702	C 6587-7
D209	1N4148 diode	C 3181-2	Q401	2N3704	C 6588-5
D210	1N4148 diode	C 3181-2	Q402	2N3704	C 6588-5
D211	1N4148 diode	C 3181-2	Q403	J177 JFET	C 6584-4

Parts List: Main Module Q42542-3 (for serial numbers 45601 and above) Contd

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
Q500	2N3702	C 6587-7	L112	22uH inductor	C 6574-5
Q501	2N3704	C 6588-5	L113	22uH inductor	C 6574-5
Q502	2N3704	C 6588-5	L114	front end coil, orange	D 6170-1
Q503	J177 JFET	C 6584-4	L200	22uH inductor	C 6574-5
Q600	2N3704	C 6588-5	L201	PLL detector coil	D 6308-7
Q601	J310 JFET	C 6049-8	L202	22uH inductor	C 6574-5
Q700	2N3704	C 6588-5	L300	15mH adjustable coil	D 6225-3
Q701	2N3704	C 6588-5	L600	2.2uH	C 6572-9
Q702	MPSA18	C 2962-5	L601	AM oscillator coil	C 6693-3
Q703	2N3704	C 6588-5	L602	AM coil	C 6694-1
Q704	2N3704	C 6588-5	L700	22uH inductor	C 6574-5
Q705	2N3704	C 6588-5	L701	12uH inductor	C 6573-7
Q706	2N3704	C 6588-5	T601	AM RF coil	D 6172-7
Q707	J177 JFET	C 6584-4	T602	AM IF coil	C 6695-8
Q800	2N3704	C 6588-5	Y600	BFU450 narrow band resonator	C 6592-7
Q801	UA7812CKC 12V regulator	C 5667-8	Y700	7.2MHz crystal	D 6375-6
Integrated Circuits			Miscellaneous		
U1	TL074	C 4696-8		FM THREE main PC board	D 6251C2
U2	TL074	C 4696-8		PC board snap in jack	C 6312-0
U3	LM13600	C 6628-9		6-32x.375 phillips rd. head screw	C 6077-9
U4	TL072	C 5070-5		20 pin DIL IC socket	C 5647-0
U200	TA7060	C 6624-8		#6 starwasher	C 5594-4
U201	TA7060	C 6624-8		TO220 heatsink	C 5341-0
U202	LA1235	C 6620-6		3 pin socket	C 5295-8
U203	TL074	C 4696-8		6-32x1 standoff	C 4882-4
U301	LA3381	C 6619-8		375x141x031 fiber washer	C 1296-0
U600	LA1245	C 6618-0	S6a	DPDT switch	C 5080-4
U700	TD6104	C 6622-2	S6b	DPDT switch	C 5080-4
U701	TC9137P	C 6623-0	S300	DPDT switch	C 5080-4
U702	TD6301	C 6621-4			
Inductors					
B200	ferrite bead	C 6709-7			
B700	ferrite bead	C 6709-7			
I200	10.7MHz filter	C 4954-1			
I201	10.7MHz filter	C 4954-1			
I202	10.7MHz filter	C 4954-1			
I301	low pass filter	C 6721-2			
I302	low pass filter	C 6721-2			
L100	front end coil, green	D 5760A8			
L101	22uH inductor	C 6574-5			
L102	12 turn coil	H42682-7			
L103	12uH inductor	C 6573-7			
L104	front end coil, blue	D 5762-6			
L105	front end coil, green	D 5760A8			
L106	22uH inductor	C 6574-5			
L107	1uH inductor	C 6571-1			
L108	36 turn coil	D 6177-6			
L109	15 turn coil	D 6178-4			
L110	22uH inductor	C 6574-5			
L111	front end coil, yellow	D 5820-2			

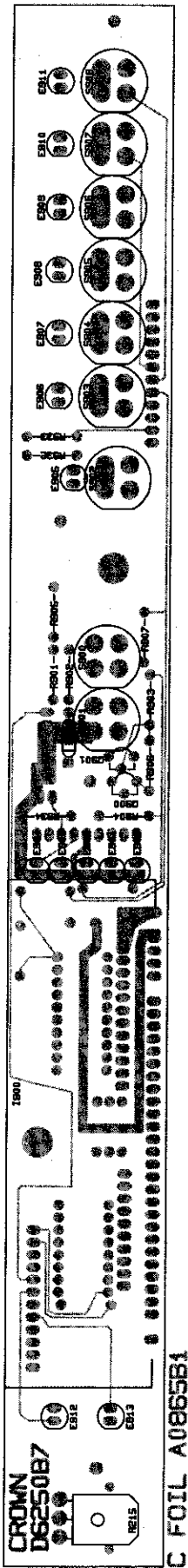


Fig. 6.6 Front of Display Module
Component Board Layout #M43409-8

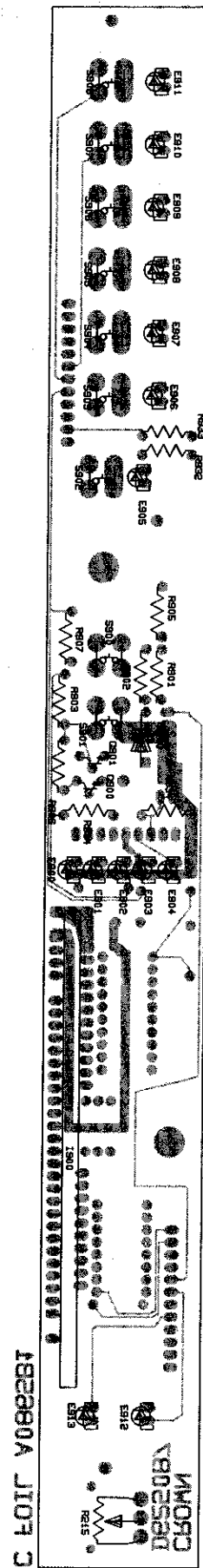
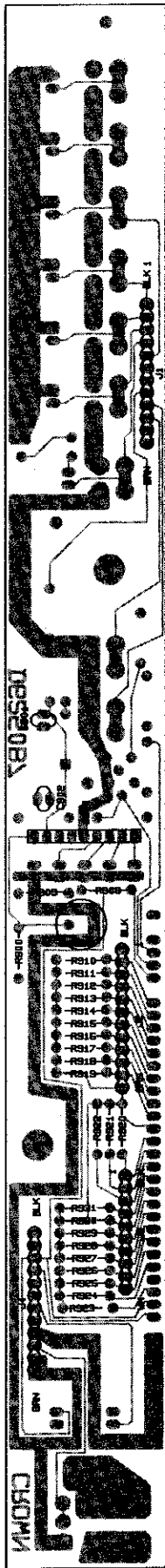
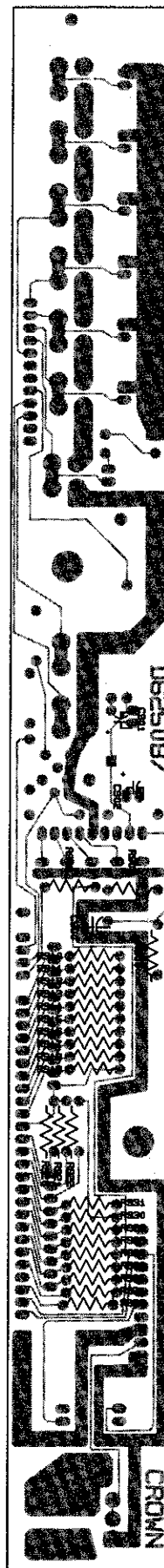


Fig. 6.7 Front of Display Module
Foil Board Layout #M43409-8



O FOIL V08E4B4



O FOIL A08E4B4

Fig. 6.8 Back of Display Module
Component Layout #M43409-8

Fig. 6.9 Back of Display Module
Foil Board Layout #M43409-8

Parts List: Display Board M43409-8

Schematic Designation	Description	Crown Part No.	Schematic Designation	Description	Crown Part No.
Capacitors			E908	LED green	C 5098-6
C900	47mF 50V	C 5219-8	E909	LED green	C 5098-6
C901	10mF 50V	C 3728-0	E910	LED green	C 5098-6
C902	10mF 50V	C 3728-0	E911	LED green	C 5098-6
Resistors			E912	LED yellow	C 5906-0
R900	10 ohms	C 3753-8	E913	LED red	C 5905-2
R901	22K ohms	C 3220-8	Transistors		
R902	22K ohms	C 3220-8	Q900	2N3704	C 6588-5
R903	8.2K ohms	C 2877-6	Q901	2N3704	C 6588-5
R904	10K ohms	C 2631-7	Intergrated Circuits		
R905	10K ohms	C 2631-7	U900	BA656	C 6484-7
R906	220K ohms	C 4219-9	Miscellaneous		
R907	100K ohms	C 2883-4	I900	fluorscent display	C 6632-1
R908	10K ohms	C 2631-7	R215	1K ohm linear pot	C 6723-8
R909	22K ohms	C 3220-8	S900	SPST momentary switch	C 6732-9
R910	10K ohms	C 2631-7	S901	SPST momentary switch	C 6732-9
R911	10K ohms	C 2631-7	S902	SPST momentary switch	C 6732-9
R912	10K ohms	C 2631-7	S903	SPST momentary switch	C 6732-9
R913	10K ohms	C 2631-7	S904	SPST momentary switch	C 6732-9
R914	10K ohms	C 2631-7	S905	SPST momentary switch	C 6732-9
R915	10K ohms	C 2631-7	S906	SPST momentary switch	C 6732-9
R916	10K ohms	C 2631-7	S907	SPST momentary switch	C 6732-9
R917	10K ohms	C 2631-7	S908	SPST momentary switch	C 6732-9
R918	10K ohms	C 2631-7		PC board	D 6250B7
R919	10K ohms	C 2631-7			
R920	10K ohms	C 2631-7			
R921	10K ohms	C 2631-7			
R922	10K ohms	C 2631-7			
R923	10K ohms	C 2631-7			
R924	10K ohms	C 2631-7			
R925	10K ohms	C 2631-7			
R926	10K ohms	C 2631-7			
R927	10K ohms	C 2631-7			
R928	10K ohms	C 2631-7			
R929	10K ohms	C 2631-7			
R930	10K ohms	C 2631-7			
R931	10K ohms	C 2631-7			
R932	220 ohms	C 5047-3			
R933	220 ohms	C 5047-3			
R934	1.2K ohms	C 2875-0			
Diodes					
E800	LED amber	C 5904-5			
E900	LED green	C 5098-6			
E901	LED green	C 5098-6			
E902	LED green	C 5098-6			
E903	LED green	C 5098-6			
E904	LED green	C 5098-6			
E905	LED green	C 5098-6			
E906	LED green	C 5098-6			
E907	LED green	C 5098-6			

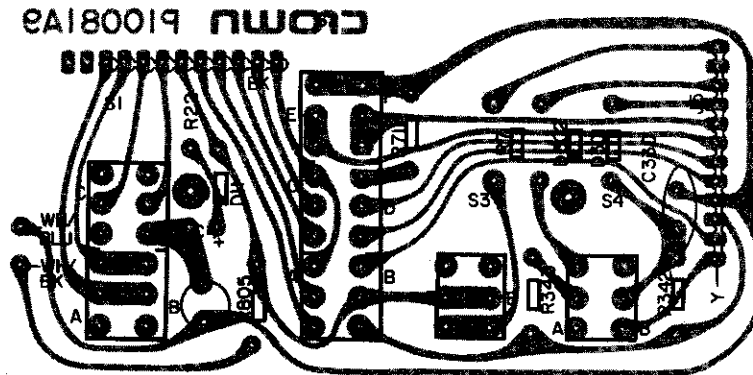


Fig. 6.10 Switch Board #M43345-4

Parts List: Switch Board M43345-4

Schematic Designation	Description	Crown Part No.
Capacitors		
C4	220mF 16V	C 3796-7
C330	.02mF	C 5230-5
Resistors		
R7	10K ohms	C 2631-7
R22	10 ohms	C 3753-8
R342	1K ohms	C 2627-5
R711	120K ohms	C 4214-7
R712	100K ohms	C 2883-4
R805	680 ohms	C 5975-5
Diodes		
D11	1N4148	C 3181-2
D301	1N4731 4.3V zener diode	C 6576-0
D302	1N4148	C 3181-2
Switches		
	1 station DPDT	C 5958-1
	3 station 6PDT/2PDT	C 6631-3
	1 station 4PDT	C 6699-0
Miscellaneous		
	PC board	P10081A9



SECTION 7 MAINTENANCE

7.1 Introduction

Section 7 contains technical information required to effectively and efficiently service and repair the Crown FM THREE. Included are disassembly and reassembly procedures, required test equipment lists, checkout procedures and basic troubleshooting tips

This information is intended for use by an experienced technician only!

Use this information in conjunction with the schematic/board layout diagrams, parts lists and exploded view drawings (the latter located in Section 6 of this manual).

7.2 Required Test Equipment

Due to the complex circuitry utilized in the FM THREE, special alignment procedures and the correct test equipment are necessary to insure original factory specifications are achieved.

The following table lists standard test bench equipment required by this procedure. The "Requirements" column provides information to allow intelligent selection of equipment model substitutes, if necessary.

EQUIPMENT	REQUIREMENTS	APPLICATIONS	MODEL
FM RF Generators - Two Required	88 to 108 MHz output FM mono and Stereo modulation	Used to generate various FM signals	Sound Technology 1020A or equivalent
AM Generator	500-1600 kHz	Used to generate AM signals	---
AC Voltmeter	100 mV to 10 V range	Measure audio output levels and signal-to-noise ratios	HP 400F or equivalent
Digital Volt Meter	---	Resistance and Voltage checks	Fluke 8020 or equivalent
Frequency Counter	Capable of measurements to 108 MHz	Monitor frequency output of RF Generator	Fluke 1912 or equivalent
Antenna Impedance Matching Box	Two 50 ohm inputs with 75 ohm output	Summing of two RF generators with a single 75 ohm output	See Fig. 7.1
Oscilloscope	15 MHz	Used for monitoring signals and signal tracing	Tekequipment D54A or equivalent
THD Analyzer	1% full scale measurement	Measure total harmonic distortion of audio output	Sound Technology 1700 or equivalent
Band-pass Filter Switch selected	200 Hz to 15 kHz	Used to bandpass limit audio output	---
One kHz Notch Filter	---	Used in IHF usable sensitivity, DBQ and 30 dB quieting tests	---
Audio Generator	20 Hz to 20 kHz sine wave output	Used to modulate FM generator for frequency response tests	---

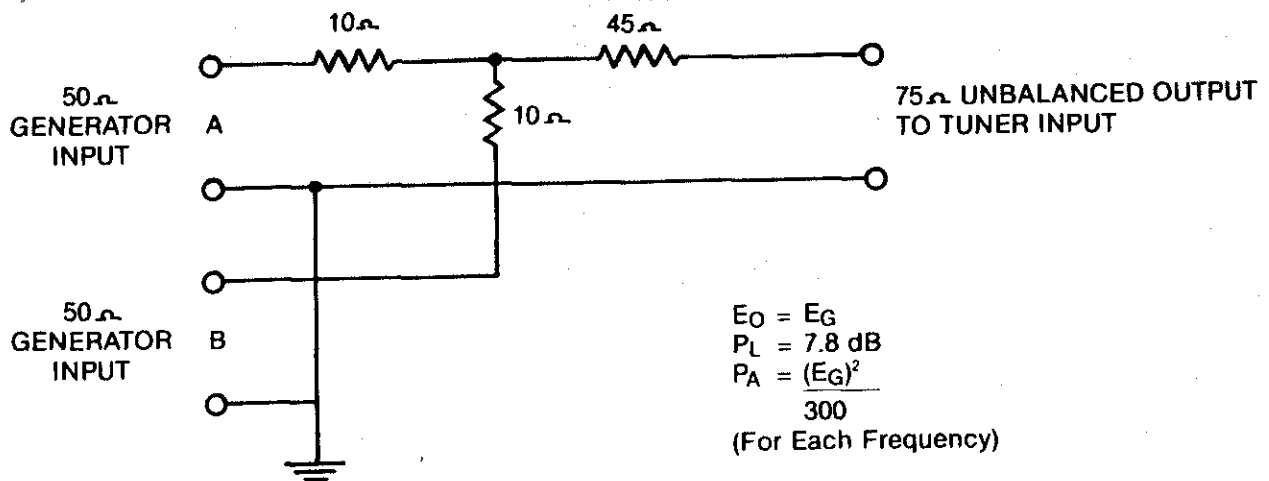


Fig. 7.1 Antenna Impedance Matching Box

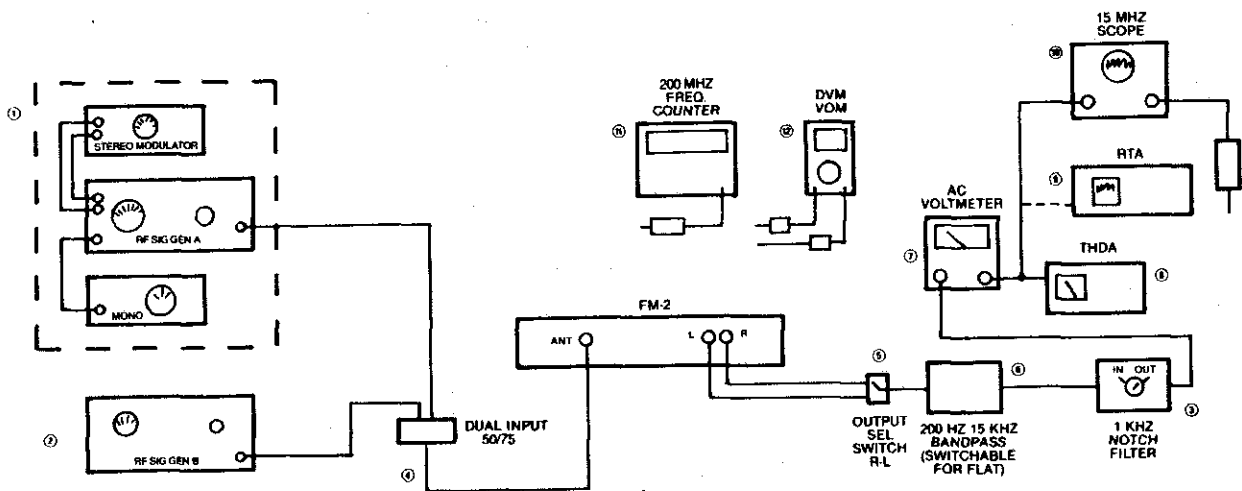


Fig. 7.2 Service Bench Setup

1. RF Signal Generator "A" 88 to 108 MHz output with stereo and mono capabilities. Output level to 1 volt. May be a single unit.
2. RF Signal Generator "B". Same as above.
3. 1 kHz Notch Filter.
4. Impedance matching box plus summation for the two RF generators.
5. Right-Left audio output selection switch.
6. 200 Hz to 15 kHz Band-pass Filter. Must be switchable for flat response.
7. AC Voltmeter.
8. Harmonic Distortion Analyzer.
9. Optional Real Time Analyzer.
10. Dual channel 15 MHz Oscilloscope.
11. Frequency Counter (200 MHz).
12. Digital Volt Meter (DVM).

7.3 Basic Troubleshooting

As is well known, time is an important factor in providing efficient service repair. Therefore, several time-saving troubleshooting steps are listed below. These hints may or may not already be implemented in your service work. If not, you may wish to experiment with them in order to help improve your efficiency. After all, time is money!

A. Establishing Problems

User complaints about defective operation may not always be clear or simple. Furthermore, the trouble the user has experienced may be due to the system and not the unit itself. If possible, talk to the user about this problem. This will usually be simpler than trying to understand written complaints. A first hand account of the problem can help in:

- 1) Getting the problem to re-occur on the service bench.
- 2) Getting an understanding of the probable cause. Some troubles will be obvious upon visual inspection. When the trouble (or its symptoms) is not so obvious ask:
 - a) Exactly what was the problem; how was it noticeable?
 - b) How was the unit being used?
 - c) Has the system as a whole been carefully examined for possible external problems?
 - d) How long had the unit been operating when the problem occurred? Was it heat related?

If the user is unavailable or unable to explain the trouble the next step is a thorough visual inspection.

B. Visual Inspection

A good visual inspection may often save hours of tedious troubleshooting. Make a habit of proceeding in an orderly manner to insure that no vital part of the following procedure is omitted. The visual inspection can be performed in 10 to 15 minutes. It is recommended both as a preventive maintenance procedure and also for its value in determining cause of malfunction.

- 1) Check that all external screws are tight and that none are missing.
- 2) Check all fuses/circuit breakers.
- 3) Check for smooth and proper operation of switches, etc.
- 4) Inspect line cord for possible damage to cap, jacket and conductors.
- 5) Remove protective covers as outlined in disassembly instruction (Section 7.4).
- 6) Check that all attaching parts for internal circuits are tight and that none are missing.
- 7) Inspect all wiring for charred insulation, or discoloration as evidence of previous overheating.
- 8) Check that all electrical connections are secure. This includes wire terminals, screw and stud type terminals, and all soldered connections.
- 9) Check for obvious destruction of internal structural parts. Distortion in any of these parts could mean that the unit has been dropped or subjected to severe shock.

7.4 Disassembly Procedure

The extent of FM THREE disassembly required will depend upon the amount of servicing required to be performed. **Do not** disassemble the unit beyond the point necessary for servicing.

A. Cover Removal

Warning: Remove AC power from unit before removing covers!

1. Remove the five screws securing the cover that is to be removed.
2. Gently lift the cover at the rear, then pull the cover towards the rear of the unit to disengage the cover front edge from the front panel flange groove. Remove the cover.

To install covers, reverse the above procedure.

B. AC Line Fuse Replacement

The AC line fuse is located on the main circuit board near the power transformer. Remove the top cover and insure that the proper replacement fuse is used.

- 100/120 VAC tuners: 1/2 amp fuse.
- 200/200 VAC tuners: 1/4 amp fuse.

C. Front Panel Removal

Access to the display/memory board and pushbuttons is obtained by removing the front panel.

1. Remove the two screws (42) located behind each rack mount bracket.
2. Gently pull the front panel assembly forward and remove.

Caution: With the front panel removed use care not to damage pushbutton switches and LEDs mounted on the Display/Memory board.

D. Display/Memory Board Removal

1. Remove front panel as described in Section 7.4C.
2. Remove top and bottom covers as described in Section 7.4A.
3. Unsolder the ribbon cables from the main circuit board.
4. Remove the four screws (24) that mount the display/memory board to the chassis. Remove the display/memory board.

E. Main Circuit Board Removal

1. Remove top and bottom covers as described in Section 7.4A.
2. Remove front panel as described in Section 7.4C.
3. Unsolder ribbon cables on the main board that come from the display/memory board.
4. Unsolder power transformer wires noting the location of each wire by drawing a wire diagram.
5. Unsolder and remove the FM and AM antenna leads noting the location of each wire by drawing a wire diagram.
6. Unsolder and remove the wires going to the power LED.
7. Remove the four screws (24) that mount the switch brackets for switches S1-S4.

8. Remove the two screws (9) that mount the audio output jacks (8) to the rear panel.
9. Unsolder and remove the two wires going to the scan lock switch.
10. Remove the two screws that mount the chassis sub-front to the main chassis and remove the sub-front chassis.
11. Remove the nine screws (27) that mount the main board to the chassis and gently lift the main board out.

7.5 Field Checkout and Alignment Procedures

Note: All signal generator voltages given are based on a 75 ohm antenna input impedance.

A. Crown Test and Check Out Procedures

Crown test and check out procedures reflect our basic design philosophy; we believe that reliability can be engineered into a product. As such, our checkout is designed to expose and correct a problem, before it happens. This testing begins when the unit is still a pile of parts; selection and grading of components is standard. The final test-inspection is the culmination of this vigorous program; but our concern doesn't stop here. Our products are backed by an extensive field service program and backed by a comprehensive warranty.

Because Crown is concerned with standard, repeatable measurements, our specification sheets are produced using standards set by IEEE Std #185-1975 and IHF Std #IHF-T-200, 1975. These standards are published by The Institute of Electrical and Electronic's Engineers Inc.

The following discussion examines each of the test procedures. This is an attempt to help you understand, in layman's terms, what the tests mean.

1. THD:

The total harmonic distortion is measured at the output of the FM THREE via a Crown custom built harmonic distortion Wave analyzer. At 1000Hz; second, third and fourth harmonic contributions are measured, noted and used in calculating the total harmonic distortion.

2. IHF Usable Sensitivity:

"Sensitivity" in this usage refers to the relative strength of input signal required to produce a standard signal to noise ratio; in this case, 30dB. With the output of the unit under test referenced to 0dB, the input signal (98.1MHz) strength is the IHF usable sensitivity spec.

3. 30dB Quieting:

This test is devoted to measuring the strength of input signal that will cause the output noise to be quieted by 30dB without simultaneous modulation. Monitoring the output via an ACVM, the input signal strength is adjusted until a 30dB difference, referenced to the amount of output noise, is measured.

4. 50dB Stereo Quieting:

Referencing the output of the FM THREE to 0dB, the strength of the input signal is adjusted until a 50dB output reference to noise ratio is noted. The resulting figure indicates the strength of input signal required to produce an output signal whose signal to noise ratio is 50dB. This figure, stated in dBf, represents the quieting of the tuner during stereo reception.

5. Signal To Noise:

The signal to noise test reveals, under simulated conditions, the ratio of usable signal to noise measured at the output of the FM THREE. This test indicates the quality of reception that you can expect with relatively strong input signals.

6. Hum and Noise:

The procedure for obtaining the hum and noise specification is essentially the same procedure used in obtaining the signal to noise spec. In this procedure, however, the 200Hz high pass filter, normally connected at the output during noise measurements, is removed to allow for the measurement of power supply hum components.

7. Stereo Separation:

Keeping the right channel information from leaking into the left channel and vice versa is desirable during the reception of a stereo broadcast. The quality of the isolation between channels is revealed in the stereo separation spec. While feeding left or right channel information into the FM THREE at its antenna terminals, the output of the opposite channel is measured at two frequencies to ensure consistency throughout the FM band.

8. Frequency Response:

The frequency response of all FM tuners is limited due to the nature of FM transmitting equipment. FM THREE's are tested to ensure a deviation of no more than +.5dB from 30Hz to 15KHz.

9. Capture Ratio:

Occasionally, there will be a situation during which two stations will be transmitting simultaneously at the same frequency. The ability of an FM tuner to discriminate against the weaker of the two signals is measured by its capture ratio. The figure obtained, represents the additional signal strength required of the stronger signal to suppress the weaker one by 30dB. Two r.f. signal generators are used to simulate a situation such as the one described above, thereby permitting the measurement of the tuner's capture ratio.

10. Alternate Channel Selectivity:

Alternate channels are those channels that lie 400KHz at either side of a desired frequency. The alternate channel selectivity spec. tells how strong an alternate channel must be in order to interfere with the reception of a desired station. Two r.f. generators are used in determining this spec. One represents the desired station, while the other represents the alternate channel.

11. R.F. IM.:

Several kinds of spurious signals plague FM reception. Most of these spurious signals in the FM THREE are so miniscule that they can be entirely disregarded. Intermodulation distortion or "cross mod." is the most measurable form of spurious response. It occurs whenever two or more undesired signals mix together within the tuner in such a way that a new frequency is produced. If this internally generated spurious frequency happens to be the same as the tuned frequency, and if the spurious signal has enough strength, interference results. Cross mod. is tested for by intentionally beating two generators' signals together. The required generator signal strength is measured and compared to the IHF usable sensitivity, and noted as a ratio.

12. Pushbuttons:

This check is to verify the correct operation of all the pushbuttons and displays.

13. IHF Usable Sensitivity:

The loop sensitivity test input is the least signal field of a specified carrier frequency, modulated 30 percent at 400 cycles and applied as induced pick-up in the loop antenna of the receiver which results in normal test output. It is expressed in dB below 1 volt per meter, or microvolts per meter.

14. AM S/N:

Is the noise power in the output? The test is performed in a screen room to eliminate spurious signals using a 30 percent modulated reference and then removing the modulation. The output is then measured as dB below the reference.

15. THD:

This test is intended to evaluate the spurious audio frequency harmonics which appear in the output, this test is performed at 1,000 kHz and 30 percent modulation.

16. dBf-uV Conversion:

The following equations may be used to convert RF signal levels from dBf to uV and uV to dBf.

Note: uV = microvolts

For 300 ohm RF impedance:

$$\text{dBf} = 20 \text{ Log } \left(\frac{\text{uV}}{.55} \right)$$

$$\text{uV} = 10 \left(\frac{\text{dBf}}{20} \right) \times .55$$

For 75 ohm RF impedance:

$$\text{dBf} = 20 \text{ Log } \left(\frac{\text{uV}}{.55} \right) + 6$$

$$\text{uV} = 10 \frac{10 \left(\frac{\text{dBf}}{20} \right) \times .55}{2}$$

B. Test Equipment Set Up

Fig. 7.2 illustrates the suggested test equipment set up for servicing and aligning the FM THREE. The following procedures will make reference to the equipment in this set up.

C. Preliminary Check and Adjustments

Note: Use chassis ground for the following measurements.

1. Preset front panel controls to the following positions:
AM/FM to FM
SNR/OFF to OFF
MONO/STEREO to STEREO
SCAN LEVEL fully CCW
SCAN/LOCK to MANUAL (out)
2. Turn unit on and check power supply voltages:
+12 volts on positive side of C806.
+5 volts on the emitter of Q800.
3.5 volts AC at junction of R807 and C808. (On serial numbers 45402 and below only.)
3. Preset the following frequencies into the units memory:
FM section:
Preset 1 — 90.1 MHz
2 — 98.1 MHz
3 — 106.1 MHz
4 — 106.5 MHz
AM section:
Preset 1 — 520 kHz
2 — 990 kHz
3 — 1610 kHz

D. FM section preliminary checkout and adjustments

1. Tuning voltage adjustments:
 - a. With the unit tuned to 106.5 MHz adjust C123 to produce 8.65 VDC at R700.
 - b. Tune unit to 90.1 MHz and adjust L111 to produce 2.35 VDC at R700.
 - c. Repeat steps a and b until both are within + or - of .05 VDC of specified voltage (adjustments will interact with one another.)
2. Front end alignment:
 - a. Set generator and tuner to 106.1 MHz. Set generator output at 50 uV and modulate mono FM signal with 1 kHz audio signal. Tune C112, C114 and C133 for best sensitivity.

- b. Set generator and tuner to 90.1 MHz and adjust L100, L104, L105 and L114 for best sensitivity.
 - c. Check tuning voltages and adjust if necessary. (Adjusting L114 will affect tuning voltages.)
 - d. Repeat steps a-c until IHF sensitivity is better than 9.13 dBf. (See IHF Usable Sensitivity Procedures)
3. I.F. Section Alignment:
- a. Set generator and tuner to 98.1 MHz. Set generator output at 50 μ V and modulate mono FM signal with 1 kHz audio signal. Tune L108 and L109 for best sensitivity.
 - b. Set generator output level to 1 mV and adjust L202 so that the DC voltage on Pin 7 of U202 equals that of the reference voltage on Pin 10.

E. FM Specification and Alignment

1. Mono THD:

- a. Feed a 98.1 MHz, 1 mV (millivolt) mono FM signal modulated at 1 kHz into the 75 ohm tuner input.
- b. Adjust the 1 kHz output levels for 0 dB at the audio output.
Note: Always make the 0 dB audio output level adjustment at the audio output jacks using the two level adjusting controls on the tuner rear panel.
- c. Check THD at each audio output for less than 0.05% distortion.

Note: For serial numbers 45601 and above, R239 is adjusted for lowest distortion possible.

2. IHF Usable Sensitivity:

- a. Use a 1 kHz notch filter to reduce the output approximately 45 dB.
- b. Reduce generator signal level until the output equals -30 dB.
- c. Signal generator level should be less than 9.13 dBf (1.6 μ V).
- d. **Record this reading** (in μ V) for use later in the RF Intermodulation test.

3. DBQ:

- a. Switch off signal generator modulation (CW).
- b. Measure audio output levels at the output jacks. Output levels should be approximately -40 to -50 dB down.
- c. Record this reading for use later in the RF Intermodulation test.

4. 30 dB Quieting:

- a. Lower the RF signal generator signal level for a -30 dB reading at the output jacks.
- b. RF signal generator level should be less than or equal to 0.7 μ V.
- c. Remove the 1 kHz notch filter.

5. Signal-To-Noise Mono:

- a. Set RF generator to 1 mV, mono FM modulated at 1 kHz (98.1 MHz). Adjust the 1 kHz audio level for 0 dB using the two level adjusting controls on the tuner rear.
- b. Insure that the 200 Hz to 15 kHz bandpass filter is in the audio output.
- c. Turn off RF generator modulation (CW) and take reading at output. The signal to noise should be 80 dB or greater.

6. Hum-and-Noise Mono:

Note: Test procedure is the same as Signal-To-Noise Mono, Step 5.

- a. Remove the 200 Hz filter from the output (Bandpass equals 0 Hz to 15 kHz).
- b. Insure the 1 kHz modulation is off (CW) and take reading at output.
- c. The hum and noise should be 75 dB or greater.
- d. Insert the 200 Hz to 15 kHz bandpass filter is in the audio output.

7. Stereo THD:

- a. Set RF signal generator to 1 mV stereo signal modulated at 1 kHz (98.1 MHz).
- b. Connect a THD analyzer to the audio output line.
- c. Connect a frequency counter to the junction of R331 and R332 and adjust R332 for 76 kHz signal.
- d. Adjust the 1 kHz audio output level for 0 dB at the output jacks using the two level adjusting controls on the tuner rear.
- e. Check THD reading. THD should be less than 0.05% distortion. Adjust L300 for minimum distortion if necessary.

8. 50 dB Quieting:

- a. With output referenced at 0 dB, turn off stereo modulation.
- b. Decrease RF signal generator output level until a -50 dB reading is obtained.
- c. RF signal generator level should be less than 36.1 dBf with the SNR circuit off. Generator level should be less than 30.3 dBf with the SNR circuit on.

9. SNR Circuit Adjustments:

- a. With the stereo generator at 10 kHz, left channel modulation only and 60% modulation on the composite meter, adjust R9 so that separation begins to decrease at 500 μ V.
- b. Do step a. again while modulating the right channel only.
- c. With the stereo modulation at 100% on the composite meter and the scan level control on the front panel fully CCW, adjust R8 so the tuner is in high blend at a signal generator level of 10 μ V. High blend should come in gradually at 13-14 μ V reaching minimum separation at 10 μ V.
Note: "High Blend" mixes the high frequencies audio content of the right and left channels together resulting in little or no audio signal output.

10. Stereo Separation:

- a. Modulate the RF signal generator left channel only at 1 kHz. Adjust the left channel tuner audio output for 0 dB at the left channel output jack.
- b. Modulate the RF signal generator right channel only at 1 kHz. Adjust the right channel tuner audio output for 0 dB at the right channel output jack.
- c. With the right channel modulated, take a left channel audio output reading.
- d. Turn off stereo modulation and take a signal

to noise reading. Both channels should be 75 dB or greater.

- e. Adjust cross-talk level pots R180 and R181 located on the Main module for the greatest separation between channels.
- f. Adjust R333 (19 kHz null pot) for minimum 19 kHz output.

11. Frequency Response:

- a. Remove the 200 Hz to 15 kHz bandpass filter from the audio output.
- b. Set RF signal generator to 1 mV stereo signal modulated at 1 kHz (98.1 MHz).
- c. Adjust the 1 kHz stereo audio output levels for 0 dB at the output jacks.
- d. Modulate the RF signal generator with 30 Hz, 10 kHz and 15 kHz stereo modulation. The frequency response from 30 Hz to 15 kHz should be plus or minus 0.5 dB.
- e. Adjust crosstalk level controls R119 and R121 for greatest separation between channels. 1 kHz separation should be 60 dB or greater.
- f. Modulate the RF signal generator at 10 kHz and repeat steps a. through d. The 10 kHz channel separation should be 45 dB or greater.

12. Capture Ratio:

Two RF signal generators and an impedance matching/summation box are required for this procedure.

- a. Set RF generator #1 to 1 mV, mono signal modulated at 1 kHz (98.1 MHz). Adjust the 1 kHz audio output levels for 0 dB using the two level adjusting controls on the tuner rear.
- b. Set RF generator #2, with unmodulated signal (CW) at 98.1 MHz.
- c. Turn the RF level of signal generator #2 up until the output of tuner reads -1 dB.
- d. Note RF level of signal generator #2 at -1 dB output level.
- e. Increase the RF level of signal generator #2 until output of tuner reads -30 dB.
- f. Note RF level of signal generator #2 at -30 dB output level.
- g. Capture ratio calculation:

$$\text{Capture Ratio} = 10 \text{ Log } \frac{\text{Reading in Step "c"}}{\text{Reading in Step "f"}}$$

Note: Ignore minus sign.

Capture Ratio should be less than 1.5 dB.

13. Alternate Channel Selectivity:

- a. Set the RF output level of signal generator #2 to 10 uV at 98.1 MHz (CW).
- b. Set the RF frequency of signal generator #1 to 97.7 MHz with 1 kHz modulation.
- c. With the tuner at 98.1 MHz, increase the RF level of signal generator #1 until the audio output level reaches -30 dB.
Note RF level of signal generator #1.

- d. Set the RF frequency of signal generator #1 to 98.5 MHz with 1 kHz modulation.
- e. With the tuner at 98.1 MHz, increase the RF level of signal generator #1 until the audio output level reaches -30 dB.
Note RF level of signal generator #1.
- f. Alternate channel selectivity calculation:

$$\text{ACS} = \frac{A + B}{2}$$

A = Log (Reading in Step "c" x100) x20
B = Log (Reading in Step "e" x100) x20
Alternate channel selectivity should be greater than 75 dB.

14. RF Intermodulation:

- a. Set RF generator #1 to 98.9 MHz, unmodulated (CW) with 10 mV output.
- b. Set RF generator #2 to 98.1 MHz, unmodulated (CW) with 10 mV output.
- c. Tune the tuner to 97.3 MHz.
- d. Turn down the RF levels of both generators equally until the output signal from the tuner equals the dBQ reading obtained in Step 3-c. When this dBQ level is reached ensure that both RF generator uV output levels are equal.
- e. Note this mV RF level reading (RFI).
- f. RFIM Calculation:

$$\text{RFIM} = 20 \text{ Log } \frac{\text{RF1}}{\text{RF2}}$$

RF2 = mV reading Step 2-d
IHF Usable Sensitivity

RF Intermodulation should be 70 dB or greater.

15. Push Buttons:

- a. Disconnect RF generator #2.
- b. Set RF signal generator #1 to 98.1 MHz, 1 mV stereo signal modulated at 1 kHz.
- c. Set tuner to 98.1 MHz.
- d. Adjust the 1 kHz audio output level for 0 dB at the tuner output jacks.
- e. Ensure that the STEREO light is illuminated on the display.
- f. Press in the NORMAL de-emphasis button:
 - Tuner output should decrease 0.8 dB.
 - Release NORMAL button.
- g. Press in the FILTER button:
 - Tuner output should decrease approximately 6 dB.
 - Release FILTER button.
- h. Press in the STEREO/MONO button:
 - Stereo signal at output should be mono.
 - Stereo indicator should turn off.
 - Release STEREO/MONO button.
- i. Press in the DIM/BRIGHT button:
 - Display and illuminated memory LEDs should dim.
 - Release DIM/BRIGHT button.

16. Stereo Indicator

Switch RF generator signal from stereo to mono signal. The tuner stereo indicator lamp should go off.

17. Scan Level Control:

- With a stereo generator signal in and the scan level control fully clockwise the stereo LED should go off between 20 to 100 μV of RF signal in.
- With the scan level control fully counter-clockwise the stereo LED should go off between 4 and 5 μV .

Note: If stereo LED stays on below 4 μV lower the value of R214 from 1.8 to 2.4 K ohms.

18. Signal Meter Level Adjustment:

- Set RF generator to 98.1 MHz, 1 mV mono FM signal modulated at 1 kHz.
- Set the tuner to 98.1 MHz.
- With the unit warm adjust R255 so that all 5 signal strength LEDs just turn on with a 1 mV RF signal input. All 5 signal strength LEDs should be off with a RF signal of 1 μV input.

19. Tune/Scan Functions:

Insure the scan up-down buttons function properly by scanning through the tuning range of the tuner.

20. Pre Set Buttons:

- Program stations into tuner memory using the six Pre Set buttons.
- Insure that the tuner programs and recalls all stations properly.
- Insure pushbuttons do not bind or push in excessively hard.
- Insure that the proper LED turns on with respective memory button.

F. AM Preliminary Adjustments

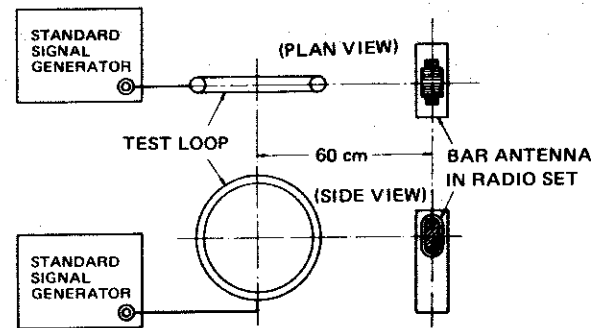
1. Tuning Voltage Adjustments:

- With the unit tuned to 1610 kHz adjust C604 to produce +9 volts at R700.
- With the unit tuned to 520 kHz adjust L601 to produce 2 volts at R700.
- Repeat steps a. and b. until both are within + or - of .05 VDC of specified voltage. (Adjustments will interact with one another.)

G. AM Section Alignment:

1. Front End Alignment:

- Position the AM loop antenna so that the center of the antenna is 24" away from the center and perpendicular to the FM THREE antenna as shown in Fig. 7.3.
- Set the AM signal generator at 520 kHz with 30% modulation at 400 Hz with the output level set at 10 μV and set the tuner to 520 kHz. Tune the FM THREE antenna slug and T601 for maximum audio signal output using a ACVM connected to the output jack.
- With the generator and tuner set at 1610



The equivalent field intensity is 26 dB less than the generator output level, or 1/20 of the output voltage.

Fig. 7.3 Position of AM Test Loop Referenced to the Loopstick Antenna

kHz adjust C601 and C626 for maximum signal output.

- With the generator and tuner set at 990 kHz adjust T602 for maximum signal output.

2. 450 kHz I.F. Frequency Adjustment:

- Connect a frequency counter to Pin 7 of U600 to insure that the I.F. frequency is 450 kHz \pm 200 Hz. Change the value of C719 to adjust the I.F. frequency. C719 is typically 62 pf.

Caution: Too large a capacitor will result in killing the 7.2 MHz oscillator.

3. I.F. Section Alignment:

- Set the AM signal generator to 990 kHz, 30% modulation at 400 Hz and the output level at 2 mV. Connect this AM signal to the external AM antenna lead (white wire from AM antenna).
- With a distortion meter connected to the audio output adjust T602 for minimum distortion.
- Turn the generator output level down to 10 μV and adjust L602 for maximum audio output signal using a ACVM.

4. Signal Meter Adjustment:

- Connect the AM signal generator to the external AM antenna lead (white wire).
- With both the generator and tuner set at 990 kHz and the generator output level at 2 mv, adjust R621 so that all 5 signal LEDs just turn on.

5. AM Sensitivity:

- Position the AM loop antenna so that the center of the antenna is 24" away from the center and perpendicular to the FM THREE antenna as shown in Fig. 7.3.
- Set the AM signal generator to 990 kHz, 30% modulation at 400 Hz and the output level at 300 mV. Adjust audio output from tuner for a -10 dB level on a ACVM connected to the output jack.

- c. Turn off generator modulation and turn ACVM down to the -30 dB reference.
 - d. Turn down generator output level until the output signal reads -30 dB on the ACVM.
 - e. Take the value of the generator output level and divide it by 20 which will give you the number of millivolts per meter figure.
6. AM THD:
- a. Set the AM signal generator to 990 kHz, 30% modulation at 400 Hz and the output level at 2 mV. Connect this AM signal to the external AM antenna lead (white wire from AM antenna).
 - b. Connect distortion analyzer to audio output and measure distortion. THD should be .22% or less.
7. AM Signal to Noise:
- a. Set the AM signal generator to 990 kHz, 30% modulation at 400 Hz and the output level at 2 mV. Connect this AM signal to the external AM antenna lead (white wire from AM antenna).
 - b. Set audio output level to -10 dB reference on the ACVM connected to the output jack.
 - c. Turn off generator modulation and turn down ACVM to get a reading for signal to noise. Subtract 10 dB for the actual signal to noise. Signal to noise should be 52 dB or less.

7.6 Detailed Circuit Theory

The following explanation refers to the schematic found in Section 6 and the block diagram Figs. 7.4 and 7.5.

FM Section

After reaching the antenna, the input signal encounters the front-end stage of the FM THREE which consists of two RF amplifiers Q100 and Q101, a mixer Q102, a tuned buffer Q105 & L114, a local oscillator Q103 and a final buffer Q200. The tuned buffer prevents two or more signals from intermixing with each other and appearing at the wrong place on the FM band (commonly called RF intermodulation). The local oscillator also feeds a signal through another buffer (Q104) to the prescaler (U700) and the LSI controller which then sends a voltage through an active filter network (Q700, Q701, Q702) to varactor diodes V101-V105. The varactor diodes are used in the RF amplifiers, local oscillator and tuned buffer stages to keep the FM THREE precisely tuned to the desired FM station.

The output of the dual gate mixer (Q102) is a 10.7 MHz signal resulting from the mixing of the local oscillator (Q103) and the incoming signal. The buffer (Q200) that follows the mixer output to the first IF amplifier is used as an impedance matching circuit.

The IF section uses linear phase type ceramic bandpass filters (I200-I203) that are precisely tuned to 10.7 MHz. IF amplifiers (U200, U201) are used to overcome the loss of the ceramic filters. No adjustments are necessary in the IF section.

For serial numbers 45402 and below:

Next the 10.7 MHz signal goes to U202 which is a quadrature detector. Two sections of this IC are used for a level and deviation detector for the mute, multipath and signal strength circuitry. The signal from Pin 13 is combined with a signal taken after the second 10.7 MHz filter through amplifier Q207, and provides FM multipath and FM signal strength information to the multipath detector (Q205, Q206), signal meter driver (U900) and the SNR circuit. The main purpose of U202 is to act as an IF amplifier and limiter to the 10.7 MHz signal. No signal detection is done in U202. Instead, the signal is sent to a 2nd IF mixer (201) where it is mixed with a 12.665 MHz signal from the 2nd oscillator (Q203). Out of the 2nd IF mixer the resultant 1.965 MHz signal is amplified through gain stage Q202. Following Q202 is a high Q bandpass filter that eliminates all signals other than the 1.965 MHz.

A pulse count type detector is incorporated in the signal detection circuitry. It is made up of gain stage Q204, monostable-multivibrator U203, lowpass filter I300, and post amplifier stage U300A. Zener diode D206 is used as a voltage regulator so that a very stable pulse width is maintained. Gain stage Q204 amplifies the signal to a TTL level for the trigger input of U203. The output Q and Q (Pins 6 & 7) of U203 is sent to U300B which is a differential op amp and helps to cancel any noise on the signal.

For serial numbers 45601 and higher:

Next the 10.7 MHz signal goes to U202 which is a quadrature detector. Two sections of this IC are used for a level and deviation detector for the mute, multipath and signal strength circuitry. The signal from Pin 13 is combined with a signal taken after the second 10.7 MHz filter through amplifier Q207, and provides FM multipath and FM signal strength information to the multipath detector (Q205, Q206), signal meter driver (U900) and the SNR circuit. U202 uses a Phase-Lock-Loop circuit to prevent the quadrature detector from drifting. Connected to the secondary of L201 is Q201 which is a voltage controlled oscillator (VCO) with a frequency of 10.7 MHz. L201 is adjusted with a 10.7 MHz signal present on Pin 1 of U202 so that the DC voltages on Pins 7 and 10 of U202 are equal. The two DC voltages that are present on Pins 7 and 10 are sent to Pins 2 and 3 of U203 which acts as an error amp. If a voltage difference occurs between Pins 2 and 3 of U203, a correction voltage is produced at Pin 1 of the op amp. This correction voltage goes to V200 which changes its capacitance and causes the VCO to change its frequency. When the VCO changes its frequency this causes a correction of the DC voltage difference between Pins 7 and 10 of U202. The detected audio signal is present on Pin 1 of U203 and goes to Pin 9 of U203. This section of U203 has a feedback circuit which is adjusted to cancel out the harmonic distortion present on the audio signal. The outputs of Pins 7 and 14 of U203 go to the station detect circuitry. These two op amp sections of U203 are used as a window

comparator circuit and produce a high on the station detect line until the desired FM station is tuned to the exact center frequency. This prevents the tuner from tuning to a strong sideband of a FM station while the tuner is scanning for stations.

From the detector circuit the signal is fed to the Phase Lock Loop MPX decoder U301 which has low distortion and high signal to noise characteristics. The composite signal from U300A is fed into Pin 2 of U301 and R333 which is adjusted for the proper feedback to cancel the 19 kHz pilot signal. The de-modulated stereo signal output of Pins 5 & 6 are fed back into Pins 7 & 8 which go to internal post amps. Channel separation is achieved by R319 and R321 which are adjusted for minimum crosstalk. Pins 9 & 10 are the outputs of the internal post amps and the stereo signal is then fed to lowpass filters I301 and I302. These lowpass filters reduce signal levels by 10 dB at 19 kHz and 45 dB at 38 kHz. The Phase Lock Loop of U301 has an internal VCO whose frequency is adjusted by R332 to 76 kHz + or - 50 Hz. Another feature not found in similar circuits is the ability to null out L-R distortion. This is accomplished by adjusting L300. U301 Pin 12 also turns on the stereo indicator E913 when the FM THREE is tuned to a stereo station. U301 can be forced into mono operation by placing switch S4B in the mono position which disconnects +VCC to the anode of E913. De-emphasis may be selected for either 75 us (USA) or 50 us (European) operation by internal switch S300.

Following the lowpass filters in the Schotz Noise Reduction™ (SNR) circuit. This circuit varies the high frequency separation according to the amount of high frequency content and signal strength of the station being listened to.

For simplicity only the right channel will be described.

The stereo signal, after leaving the input buffer U1A, goes to a rectifier circuit, a summing amp and transconductance amp which make up the SNR circuit.

The rectifier circuit is made up of U2C, Q500, Q501, U2D and Q502. U2C and Q500 make the rectifier circuit which changes the stereo signal into a DC voltage. This DC voltage is amplified by gain stage Q501 and U2D. Finally the DC voltage goes through Q502 which is a log converter and is then fed to Pin 16 of U3.

U3 is a transconductance amplifier in which the amount of high frequency signal from one channel being fed into the other channel is controlled. The stereo signal from the left channel is fed into Pins 3 & 4 and the right channel is fed into Pins 13 & 14. The DC control voltages are fed into Pins 1 & 16 and these voltages control the amount of signal that comes out of Pins 5 & 12. If the stereo signal has a lot of high frequency content, then the DC control voltages are low and no signal comes out of Pins 5 & 12. If the stereo signal has very little or no high frequency content, then the DC control voltages are high and signal is present at Pins 5 & 12. Considering the right channel, the

signal from U3 Pin 5 is the left channel signal and passes through R419 & C402 which are a one pole high pass filter and allow the signal to blend the high frequencies of both channels together. This signal is then sent into the summing amplifier U1B. Besides the voltage from the DC control voltage circuit there are two other control lines that feed a voltage to Pins 1 & 16 of U3, when certain conditions are met. Q1 has two inputs to its base, one being the station signal strength and the other being high voltage when S4B is in the mono position. When either of these inputs are high they cause Q1 to turn on and +12 VDC is conducted to R9. R9 is adjusted so that a station signal strength of 60 dB or greater turns on Q3 which places a low on Pins 1 & 16 of U3, thus turning off the SNR circuit. Switch S3A (the SNR ON/OFF switch mounted on the front panel) will also send a high to the base of Q1 and allows the user to turn the SNR circuit off if desired. The other control to Pins 1 & 16 of U3 comes from Q2 and R8 and is adjusted so that a signal strength of 25 dB or less turns Q2 off and allows a high voltage on Pins 1 & 16 of U3 which places the SNR circuit into a constant high blend.

After the summing amp, the audio signal goes to U4B output amplifier whose gain is varied by R424, which is mounted on the back panel. The output of U4A goes to Q403 which acts as a transmission gate. When the gate of Q403 is low, no signal is allowed to J7 the output jack. When the gate of Q403 is high, signal is allowed through to J7.

The mute circuit is controlled by U701, the TC9137P controller, and power switch S1D. When the unit is first turned on +12 VDC conducts through D11 which allows current to flow through C4. Switch S1D connects the junction of R22 and C4 to the gates of Q403 and Q503. While C4 is charging, a low is maintained on the gates, which keeps the audio signal muted. After approximately 3 seconds, C4 is fully charged and a high is placed on the gates of Q403 and Q503 allowing the audio signal to pass. When the controller U701 wants to mute the audio output during channel changes or low signal strength conditions, it sends a high to Q4 which turns on Q5 and allows a low to be present on the gates of Q403 and Q503.

AM Section

Starting with the AM antenna which is mounted on the back panel, the AM signal is received and sent to Q601. Q601 is a FET which gives the incoming signal more gain and provides better overload characteristics before the signal enters U600. U600 is a LA1245 IC which has the RF amps, IF and detector circuits all built on one substrate and with supporting external parts makes up the entire AM section. When an AM station is selected, U701 (Controller) sends a tuning voltage to the local oscillator to varactor diodes V600 - V602 which are used to tune the antenna and local oscillator circuits. C604 and L601 set up the tuning band for the local oscillator. In the IF section, T602 is used which is a dual IF coil with a ceramic filter inside for better IF tuning. Y600 is a very narrow IF filter used in the station detect circuit. Out of Pin 16 of U600 is a

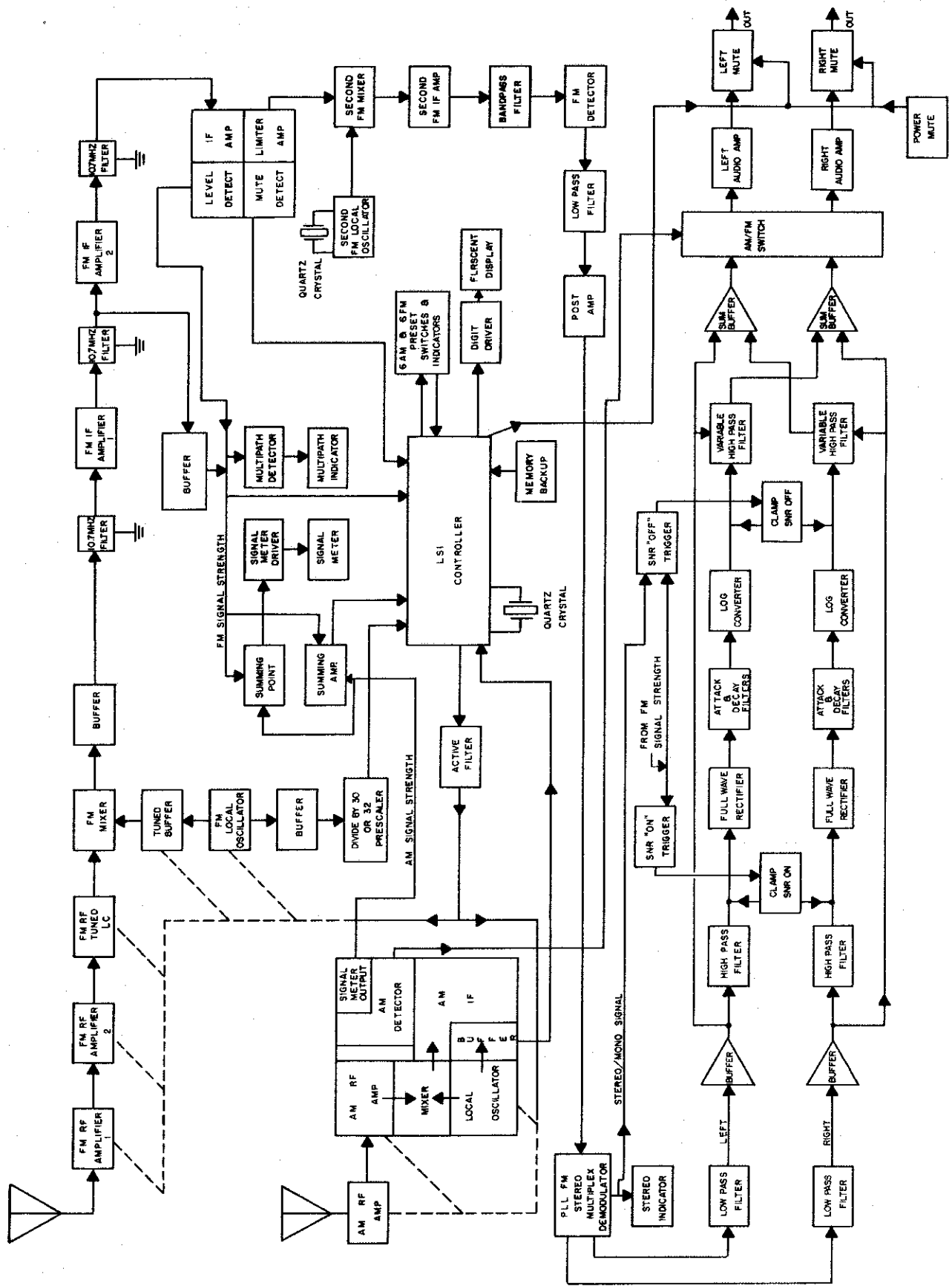


Fig. 7.4 Block Diagram
(for serial numbers 45402 and below)

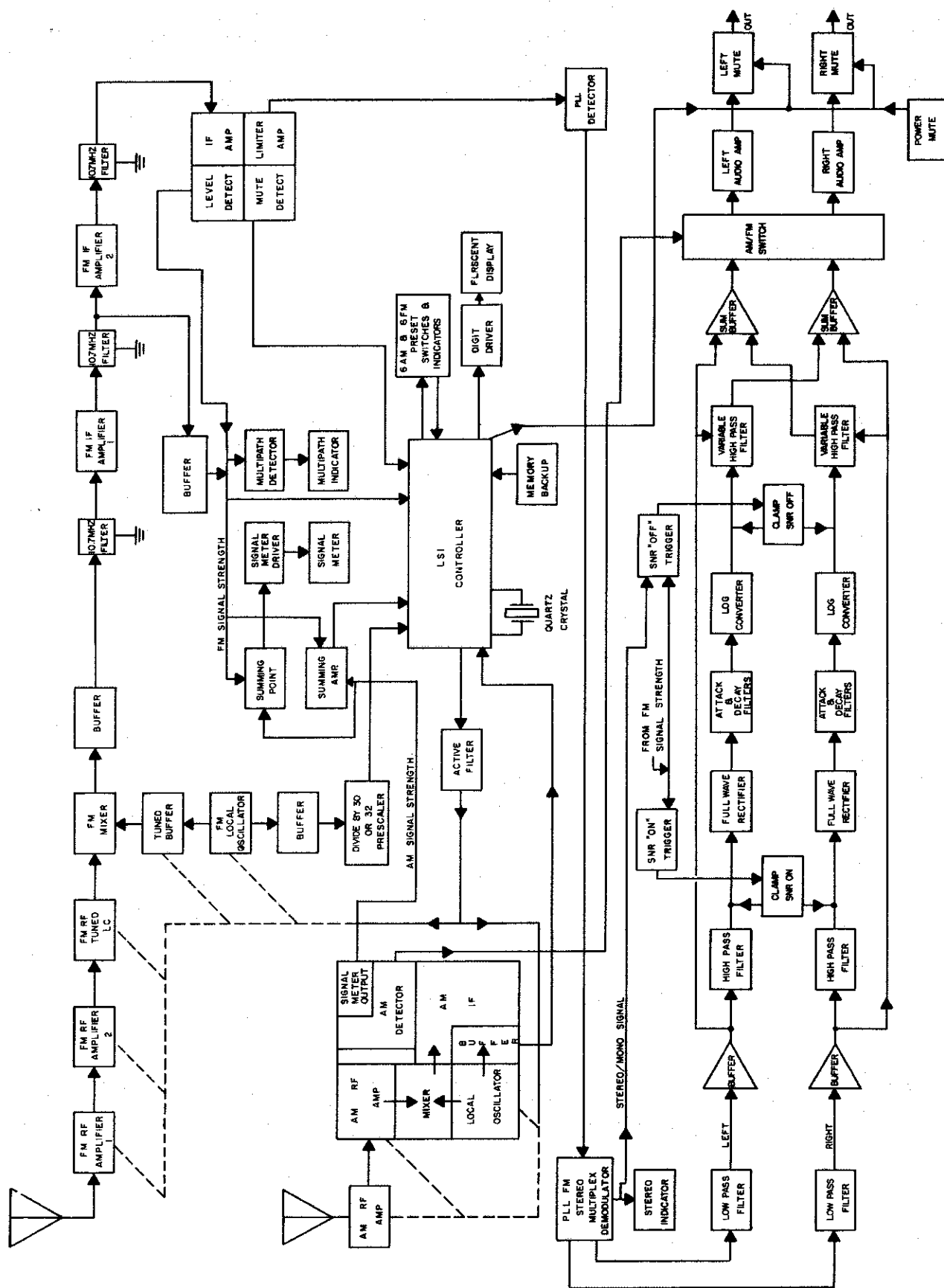


Fig. 7.5 Block Diagram
(for serial numbers 45601 and above)

signal that goes to R621. R621 adjusts the AM signal strength to the signal meter and to Q703 and Q704 which provide gain for the AM station detect input to U701 Pin 12. R608, C615, C613 and R607 is a "Birdie" Filter network to reduce unwanted signals. Finally, the detected AM audio signal goes to Q600 which brings the level of the signal up to that of the FM audio signal. When the AM section is selected by band select switch S2B, +VCC is disconnect from the FM circuit. +VCC is then disconnected from the AM section when switch S2B is in the FM position.

Controller Section

U701 is the "brain" of the FM THREE and controls the display, muting and tuning of the unit. It has built in memory which is kept active when the unit is unplugged from the AC outlet by C704 which is a 4700 mF capacitor connected to Pin 42. Display information is sent out of Pins 20-22 which go to display driver U702. Pin 23 sends a signal to Q900 and Q901 which turn off the decimal point while operating as an AM tuner. Station preset LEADS E905-E911 are driven directly by Pins 13-19. Muting voltage is sent out of Pin 36 to the Mute circuit. Pin 33 sends a signal to the Tuning Voltage Charge Pump and Filter circuit. This signal is used to tune both the FM and AM front ends. Switch S6B is used to change the FM frequency stepping from 100 kHz to 50 kHz. Q707 is used to bring Pin 40 low during turn off which puts the controller into a low current standby state. This helps to insure that C704 isn't discharged at the initial turn off.

Power Supply

The FM THREE power supply is a fairly straight forward power supply with a few exceptions. Q800 and D812 are used to provide +5 volts DC to various ICs. The display needs an AC voltage for the filament and is accomplished by U800A&B, Q802 and Q803 which with supporting parts make up a 60Hz push-pull oscillator. D809 and D810 are used to clamp the level of the oscillator output signal. R817 is used to sync the oscillator frequency to that of the AC line frequency. This prevents the oscillator from beating with the AC line frequency causing the FM THREE's signal to noise to degrade.

7.7 Voltage Conversion

Often Crown products are purchased in one country and later moved to another requiring an AC mains conversion. For this reason the following tables as well as a world-wide voltage map are provided.

The FM THREE power supply may be connected for any of four voltages. Converting from one to another can be accomplished by rearrangement of transformer wires according to voltage conversion tables (Fig. 7.6).

1. Remove top and bottom covers.
2. With the covers off locate the voltage conversion solder pads near the power transformer.
3. Make the appropriate wiring changes (Fig.

- 7.6) to obtain desired voltage range.
4. Install the correct fuse in the unit (see Section 7.4B).
5. Change the AC line cord tag to read the correct voltage.
6. Replace covers.

FOR DESIRED VOLTAGE PLACE WIRES AS SHOWN BELOW.

100V	BK	W		R/BK		R/W	GN/BK	GN/W
220V		W	GN/W	GN/BK	BK	R/W	R/BK	
240V		W	BK	GN/BK	R/W	GN/W	R/BK	
120V	BK	W		GN/BK	GN/W		R/BK	R/W

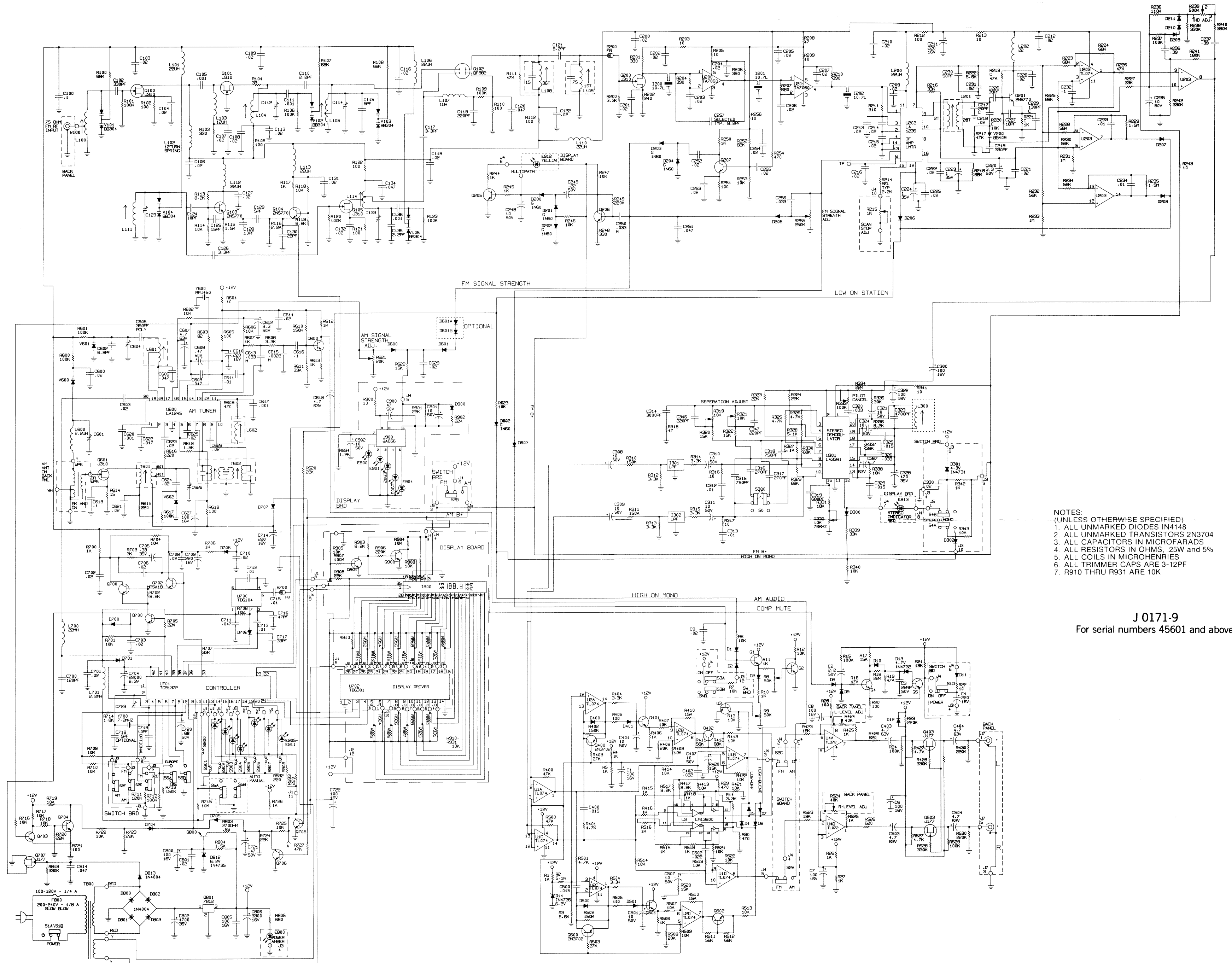
FOR SERIAL NUMBERS 45601 AND ABOVE.

FOR DESIRED VOLTAGE PLACE WIRES AS SHOWN BELOW.

100V	BK	W		RED		ORG	GRN	GRAY
220V		W	GRAY	GRN	BK	ORG	RED	
240V		W	BK	GRN	ORG	GRAY	RED	
120V	BK	W		GRN	GRAY		RED	ORG

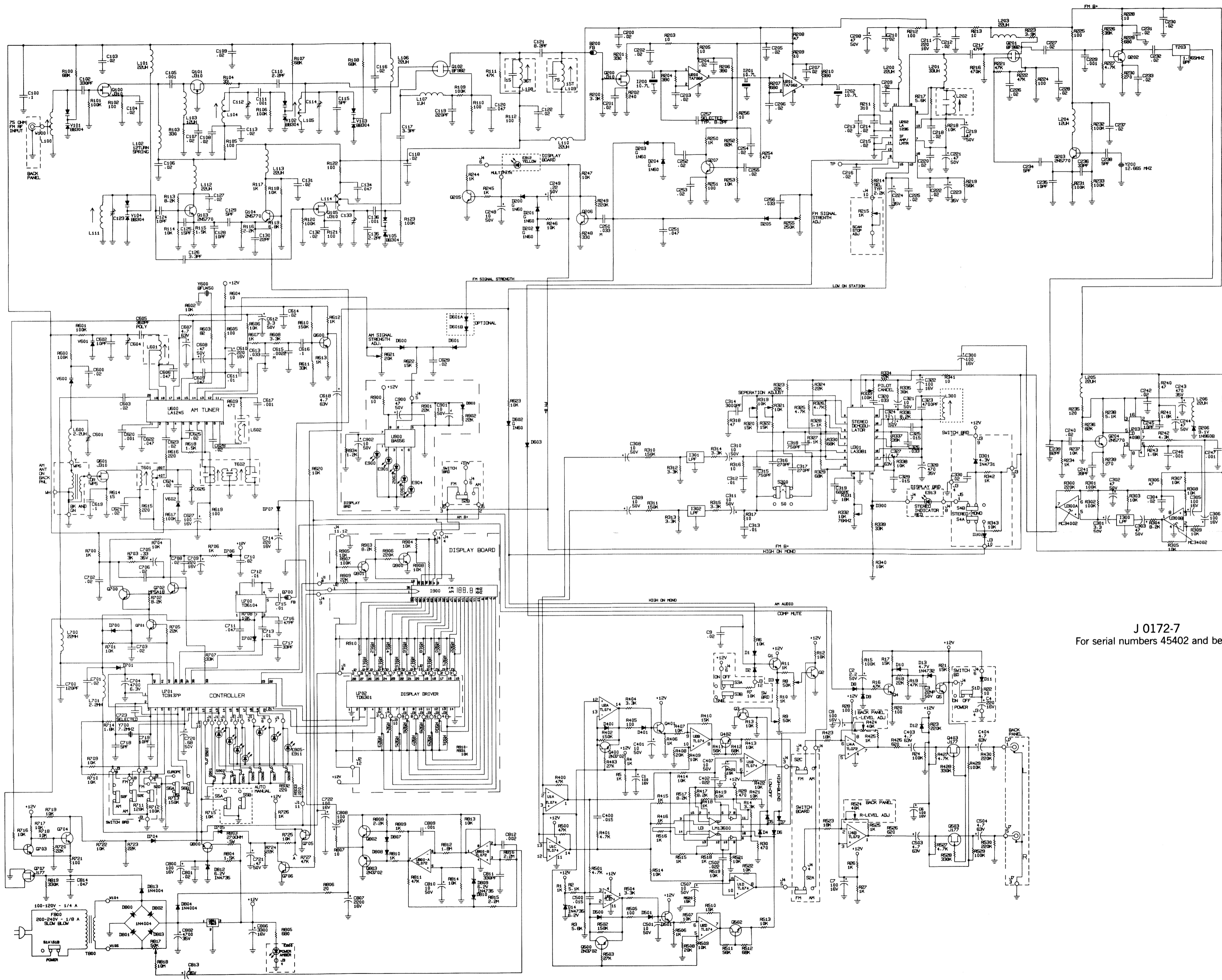
FOR SERIAL NUMBERS 45402 AND BELOW.

Fig. 7.6 Voltage Conversion Tables



- NOTES:
 (UNLESS OTHERWISE SPECIFIED):
 1. ALL UNMARKED DIODES IN4148
 2. ALL UNMARKED TRANSISTORS 2N3704
 3. ALL CAPACITORS IN MICROFARADS
 4. ALL RESISTORS IN OHMS, .25W and 5%
 5. ALL COILS IN MICROHENRIES
 6. ALL TRIMMER CAPS ARE 3-12PF
 7. R910 THRU R931 ARE 10K

J 0171-9
 For serial numbers 45601 and above.



J 0172-7
For serial numbers 45402 and below.

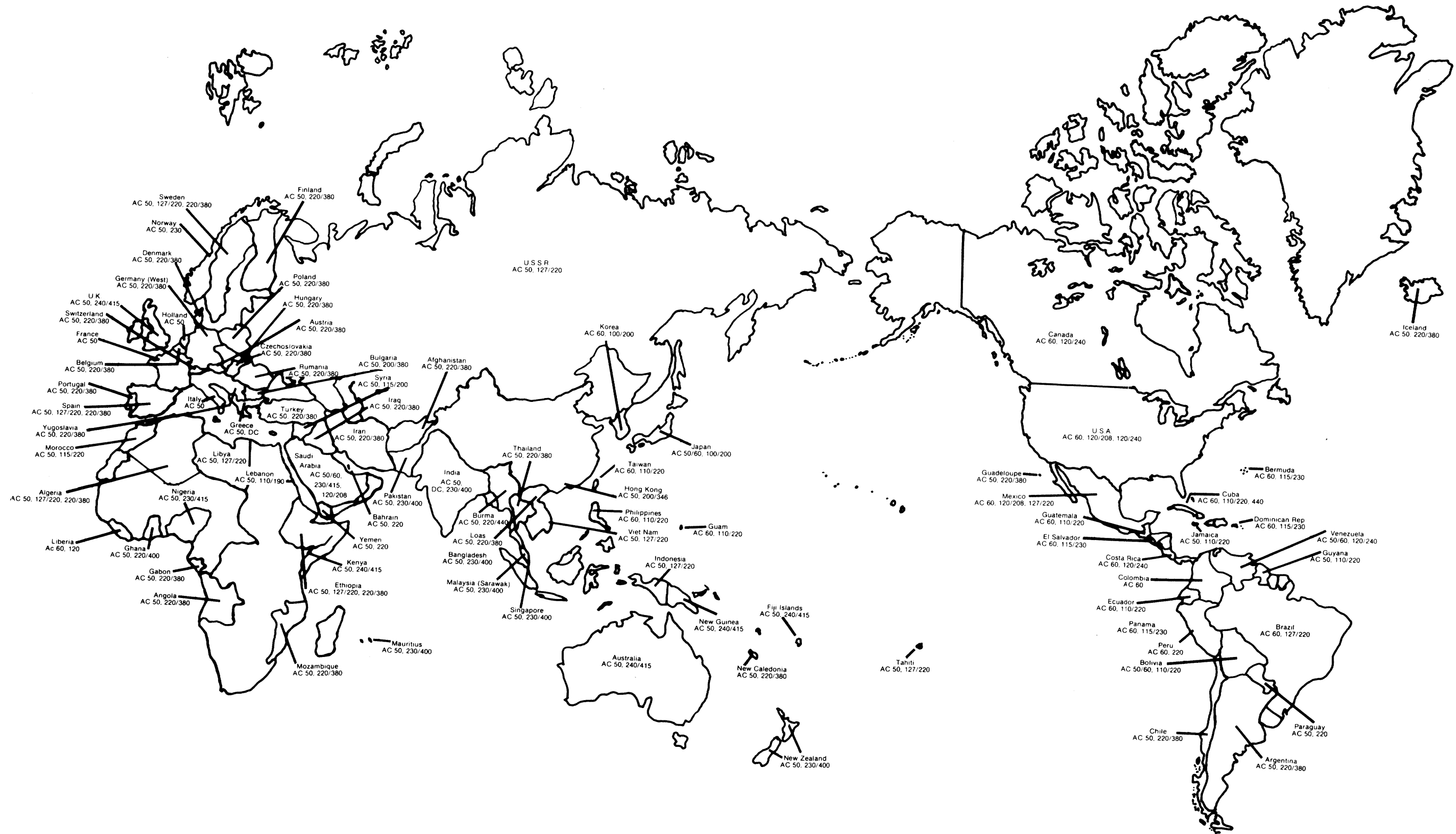


Fig. 7.7 World-Wide Voltage Map