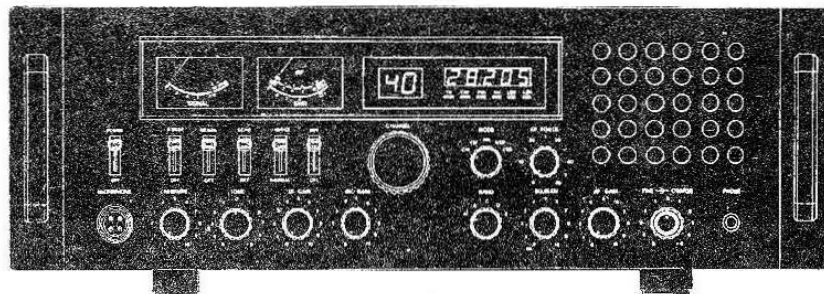


GALAXY SATURN

Service/Owners Manual



Schematics
Operating Instructions
Alignment Procedure
Complete Voltage Information
Transister & IC Pinouts
Repair & Conversion Tips
Channel Chart

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GALAXY SATURN SPECIFICATION INFORMATION

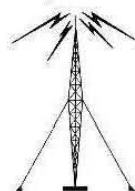
GENERAL SPECIFICATIONS	
Channels	Over 3000 Channels
Modulation Modes	CW,FM,AM,USB,LSB
Frequency Range	5-Band 26.065 - 28.305 6-Band 25.615 - 28.305
Frequency Control	Phase-Locked Synthesizer
Frequency Tolerance	±0.005%
Frequency Stability	±0.003%
Operating Temperature Range	-30° C to +50° C
Microphone	Plug-In - 4Pin, 600Ohm Dynamic Type
AC Input Voltage	110V 60Hz (220V 50Hz)
AC Power Consumption	90 Watts Average
Antenna Connector	Standard SO-239
Semiconductors	9 IC, 1 FET, 61 Transistors
Meter #1	Shows relative RF power output/Antenna SWR
Meter #2	Shows Received Signal Strength in "S" Units

TRANSMITTER SPECIFICATIONS	
Power Output	CW/AM/FM 10 Watts LSB/USB 21 Watts
AM Modulation	Class B amplitude, collectors modulation, up to 100%
SSB Generation	Dual-Balanced Modulation
FM Deviation	±1.5 KHz @ 1,250Hz 20mV Audio Input
Clarifier Range	±5 KHz
Harmonic & Spurious Emmision	Better than 60dB
AM/FM Frequency Response	400 to 5000 Hz
SSB Frequency Respnose	400 to 3000 Hz
Output Impedance	50 Ohms Unbalanced
Output Indicators	Rf Meter shows Relative RF output Power

RECEIVER SPECIFICATIONS	
Am Sensitivity	1 µV for 10dB S/N
FM Sensitivity	1 µV for 20dB S/N
SSB Sensitivity	0.2 µV for 10dB S/N
AM/FM Selectivity	5 dB at 4 KHz, 50dB at 10KHz
SSB Selectivity	5 dB at 2 KHz
Image Rejection	More than 50 dB
IF Rejection	More than 80 dB at 455KHz
AGC Capabilities	Change in audio output less than 12 dB: from 10 µV to 0.4V
Squelch	Adjustable - threshold less than 0.7 µV
Audio Frequency Response	400 to 2,500 Hz
Audio Distortion	Less than 10% at 2 Watts output into 8 Ohms
Adjacent Channel Rejection	Greater than 75 dB
Cross Channel Modulation	Greater than 50 dB
Intermediate Frequency	10.695 MHz [AM-1st,SSB] 455 KHz [AM-2nd]
Clarifier Range	±5 KHz
Noise Blanker	IF single gate type
Audio Output Power	More than 3 Watts into 8 Ohms
Built-in Speaker	8 Ohms, Dynamic
External Speaker Jack	Disables Internal speaker when optional Ext. speaker is used

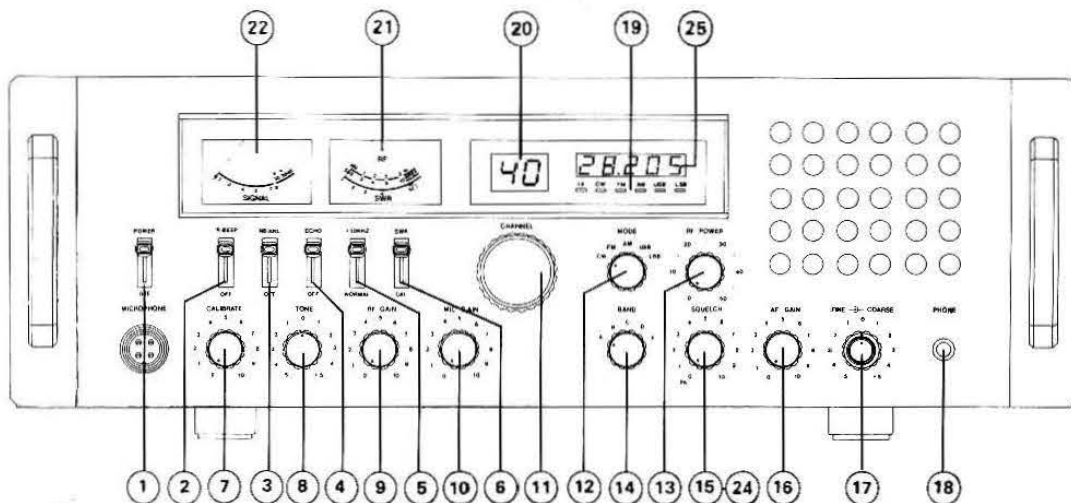
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Radio Operation Guide Section

Front Panel



Switch & Control Functions

1. POWER / On-Off Switch

Turns unit on when placed in the POWER (lever up) position.

2. R. BEEP Switch

Activates the ROGER BEEP circuit when placed in the R. Beep (lever up) position.

3. NB/ANL Switch

Activates the Noise Blanker-Automatic Noise Limiting circuit when placed in the NB/ANL (lever up) position.

4. ECHO

Activates the ECHO circuit when you want to add an echo effect to your transmitted voice. The echo is activated only during transmit and has no effect on receive.

5. +10KHz Switch

This switch when placed in +10KHz (lever up) position, raises your frequency 10 KHz. i.e. 27.105MHz + 10KHz = 27.215MHz

6. SWR-CAL Switch

Controls the SWR Meter for either CALIBRATE or SWR read-out.

➤ CAL (lever down)

Used in conjunction with the Calibrate control to set SWR Meter prior to measuring your SWR ratio.

➤ SWR (lever down)

Read your SWR ratio after proper calibration, and while keying the radio on AM/FM/CW.

7. CALIBRATE Control

Used in conjunction with the SWR-CAL switch for calibrating the SWR meter prior to reading your SWR ratio.

8. TONE Control

Allows control of the tone during receive. Fully clockwise position adds more of a base sound to incoming audio.

9. RF GAIN Control

Allows you to either decrease or increase the incoming signal strength during receive. Normally used to decrease strong or otherwise distorted signals. Normally this control is turned fully clockwise to provide maximum receiver gain.

10. MIC GAIN Control

Used to either increase or decrease this amount of modulation being input into the MIC pre-amplifier circuit from the mic.

11. CHANNEL Selector

Used to select desired channel for receive and transmit operation.

12. MODE Selector

Allows selection of 5 different modes of operation.

- CW Continuous Wave Mode
- FM Frequency Modulation Mode
- AM Amplitude Modulation Mode
- USB Upper Side Band Mode
- LSB Lower Side Band Mode

13. RF POWER Control

Used to adjust RF output power level During CW/AM/FM transmit. This control does not function in SSB mode

14. BAND Selector Switch

Used in conjunction with the channel selector to select different frequency bands.

15. SQUELCH Control

Used to eliminate or cut off background noise in the absence of an incoming signal. This control should be adjusted just to the point that the background noise is eliminated for maximum receiver sensitivity. If adjusted to the fully-clockwise position, only the strongest signals will be capable of activating the receiver.

16. AF GAIN Control

Used to control the volume of a received signal when using the internal, external, or headphone speakers.

17. FINE - COARSE Control

Allows variable control of the radio operating frequencies. This control is mainly intended to tune in SSB signals, it may also be used to tune AM/FM operating frequencies. The Coarse and Fine adjusts both Transmit and Receive frequencies.

18. PHONE Jack

Allows use of a headset of 4 to 32 Ohm impedance. This allows for private listening during receive. Once the headset is plugged into phone jack the internal speaker (or External Speaker if attached) is deactivated.

19. FUNCTION Indicators

Shows mode of operation as Mode selector is changed.

20. CHANNEL read-out LED

LED read-out of the selected channel.

21. POWER - SWR METER

Dual function meter used to show either relative transmit power or SWR ratio. The power has separate scales for AM, FM,SSB, and CW modes.

22. SIGNAL ("S") METER

Provides a relative read-out of the received signal strength in "S" units.

23. Push-To-Talk Microphone

Activates the radio for TRANSMIT or PA operation. When the Push-To-Talk switch is pressed the radio receiver is deactivated while in Transmit or PA mode.

24. PA Switch (Pull-Switch)

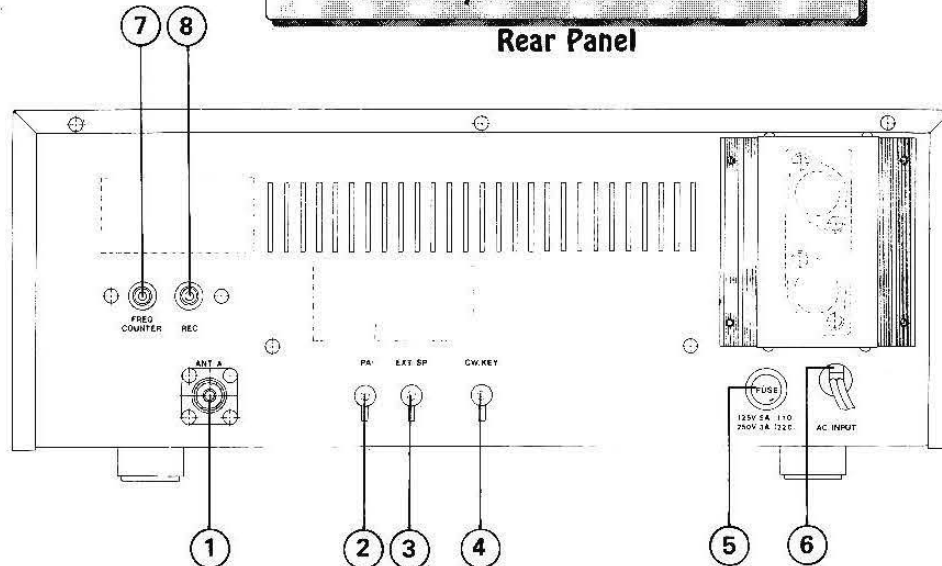
Activates Public address mode when switch is pulled. Be sure to use this function only when an external speaker is connected to the PA/SP jack.

25. Frequency Counter

5 digit Frequency read-out of the selected channel in MHz. Note that although the frequency counter will show change as the clarifier is adjusted, it is limited by the fact that it is only a five digit read-out.

Radio Operation Guide Section

Rear Panel



REAR PANEL CONNECTORS

1. ANTENNA

S0-259 type connector that accepts a standard PL-259 type connector.

2. PA Speaker Jack

Allows the radio to be used as a Public Address system when an external speaker (8 to 16 Ohms, 3 Watts or higher) is plugged into this jack. This jack accepts a 1/8" (3.6mm) diameter plug. Be sure to place the external speaker away from the microphone in order to prevent unwanted feedback.

3. EXTERNAL Speaker Jack

Used to connect an external speaker (8 to 16 Ohms) for enhanced sound qualities or remote listening. This jack accepts a 1/8" (3.6mm) diameter plug.

4. CW Keyer Jack

Used for morse code (CW) operation when a CW Key is connected to this jack. Radio must be in CW mode for Morse code operation.

5. FUSE Holder

Fuse holder for AC input circuit protection. Recommended fuse for 110V operation is 5Amp 125V.

6. AC Power Cord

Cord for providing AC power to the radio.

7. Frequency Counter Output Jack

RCA-type (pin) jack is used for connecting an optional frequency counter. Note that this jack provides frequency out-put only during transmit mode.

8. Recording Output Jack

Provides a way to connect an external tape recorder for recording received and/or your transmitted signals. This connector accepts a standard RCA (pin) type connector.

SWR MEASUREMENT OPERATION

1. Place the radio in **AM** mode.

2. Place the **SWR-CAL** switch to the **CAL** position.

3. Turn the **MIC GAIN** control to the fully counter-clockwise position. This will prevent your calibration from being off, caused by any background noise. Also be sure to turn off the Echo and Roger Beep while checking your SWR.

4. Now press the **Push-to-Talk** switch and at the same time adjust the **CALIBRATE** control clockwise past the click so that the **SWR** meter reads exactly on the **SET** mark. Release the Press-to-Talk switch.

5. Place the **SWR-CAL** switch to the **SWR** position and then press the **Push-to-Talk** switch again. While depressing the Push-to-Talk switch and read the **SWR** directly on the **SWR** meter. The **SWR** reading should be below a 2 or less for best overall performance A reading of 2 or higher shows that there is an **ANTENNA** or **COAX** problem, that needs to be corrected. A reading of 3 or higher can cause damage to your radio's transmit section.

6. Once this procedure has been performed, be sure to turn the **CALIBRATE** control fully counter-clockwise until it clicks. This will allow the **RF/SWR** meter to display relative transmit power while transmitting.

PLL Circuit Theory

PLL is an abbreviation of the phase-locked loop, which is fundamentally composed of a closed loop feedback circuit. The feedback component is the balance of frequency drifts and the PLL circuit acts to cancel it out. To detect out the frequency drifts of the PLL output, a fixed reference oscillator (10kHz, 1/1024 divided down from 10.240 MHz) is compared constantly with the input frequency (10kHz). The input frequency is obtained by dividing the VCO frequency. A functional block diagram is provided below under 'PLL CIRCUIT' for easier understanding.

OFF-SET FREQUENCY OSCILLATOR TR-29

The off-set frequency oscillator TR-29 oscillates at 14.460 Mhz for all bands in the five band version and 14.010 for all bands in the 6 Band version. Switching between these oscillating frequencies is made by biasing the diodes D97 to D111.

The off-set frequency signal is obtained at TR-29 emitter and flows through L-16 and C-88 into TR-25 mixer where it is beat with the VCO signal.

The VCO signal is obtained from the following.

$$f_{vco} = f_{off-set} + N f_r$$

Where, f_{vco} = VCO frequency, N = programming code for the divider output, f_r = reference frequency step, 0.01 MHz. i.e. At channel #1 in band A, and AM band, the corresponding N code is 91.

FIVE BAND VERSION

A Band Channel 1

$$f_{vco} = 14.460 + (91 \times 0.01) = 15.370 \text{ MHz}$$

or

SIX BAND VERSION

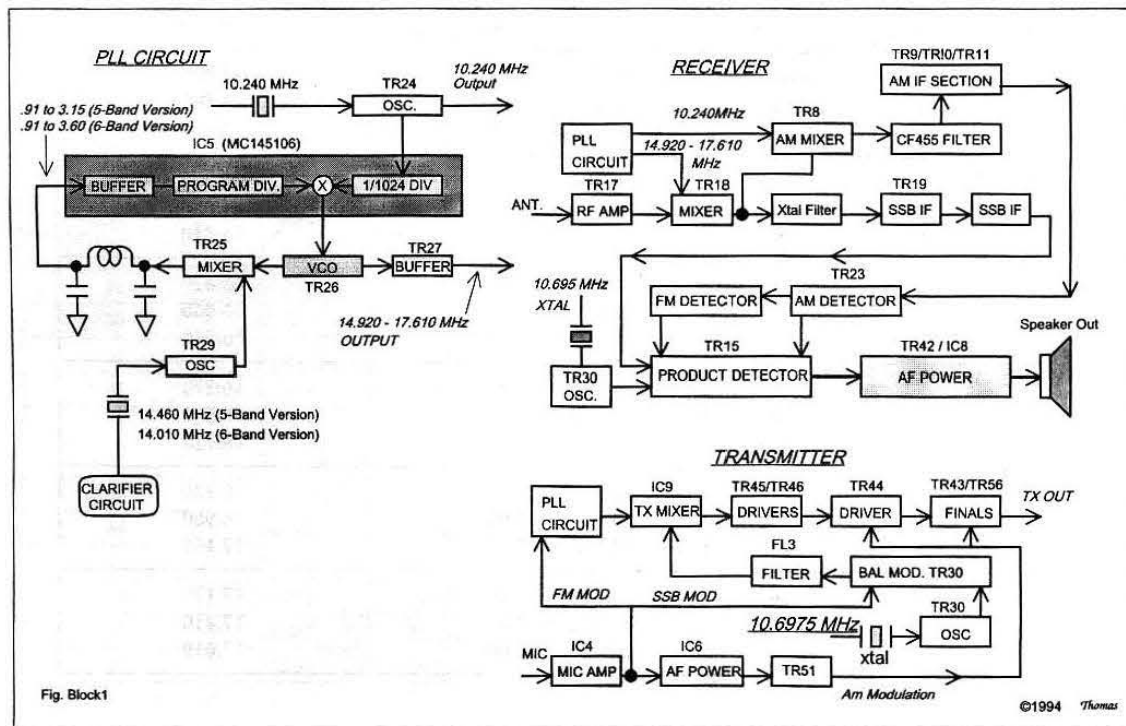
A Band Channel 1

$$f_{vco} = 14.010 + (91 \times 0.01) = 14.920 \text{ MHz}$$

Since the mixer output is determined by two factors, the off-set frequency output (dependent on the band selector switch position) and the VCO output, the mixer output contains the subtracted frequencies of 0.91 to 3.15 MHz. for the **Five Band Version** and .91 to 3.60 for the **Six Band Version**. These frequencies appear on pin #2 of IC-5 through C-82, and divided by the programmable divider in IC-5 down to 10 KHz which is compared with another 10 KHz signal obtained from the reference oscillator (10.240).

The VCO output is mixed with the off-set frequency signal and applied to the TX mixer IC-9 through band-pass filters L-43 and L-44. i.e. At channel 1 in Band A (**Five Band Version**), and set to AM Band, the TX mixer accepts $15.370 + 10.695 \text{ MHz}$ (From TR-30, Oscillator) = 26.065 which is the TX frequency.

When receiving in channel 1, Band A (**Five Band Version**) (26.065 MHz), the first RX mixer TR-18 accepts 15.370 local signal at its base, and converts it down to 10.695 MHz IF (for AM/FM modes, this is the 1st intermediate frequency). TR-18 then off-sets the 10.695 MHz signal so that TR-30 can oscillate at 10.6975 MHz for LSB.



VCO OUTPUT REFERENCE FREQUENCY CHART				
5 Band Version using the 14.460 Oscillator Crystal				
Band	Channel	Ch.Frequency	Xtal Reference + N _f P. Code	AM/FM
A	1	26.065	14.460 + .910	15.370
	19	26.305	14.460 + 1.15	15.610
	40	26.505	14.460 + 1.35	15.810
B	1	26.515	14.460 + 1.36	15.820
	19	26.755	14.460 + 1.60	16.060
	40	26.955	14.460 + 1.80	16.260
C	1	26.965	14.460 + 1.81	16.270
	19	27.205	14.460 + 2.05	16.510
	40	27.405	14.460 + 2.25	16.710
D	1	27.415	14.460 + 2.26	16.720
	19	27.655	14.460 + 2.50	16.960
	40	27.855	14.460 + 2.70	17.160
E	1	27.865	14.460 + 2.71	17.170
	19	28.105	14.460 + 2.95	17.410
	40	28.305	14.460 + 3.15	17.610

VCO OUTPUT REFERENCE FREQUENCY CHART				
6 Band Version using the 14.010 Oscillator Crystal				
Band	Channel	Ch.Frequency	Xtal Reference + N _f P. Code	AM/FM
A	1	25.615	14.010 + .910	14.920
	19	25.855	14.010 + 1.15	15.160
	40	26.055	14.010 + 1.35	15.360
B	1	26.065	14.010 + 1.36	15.370
	19	26.305	14.010 + 1.60	15.610
	40	26.505	14.010 + 1.80	15.810
C	1	26.515	14.010 + 1.81	15.820
	19	26.755	14.010 + 2.05	16.060
	40	26.955	14.010 + 2.25	16.260
D	1	26.965	14.010 + 2.26	16.270
	19	27.205	14.010 + 2.50	16.510
	40	27.405	14.010 + 2.70	16.710
E	1	27.415	14.010 + 2.71	16.720
	19	27.655	14.010 + 2.95	16.960
	40	27.855	14.010 + 3.15	17.160
F	1	27.865	14.010 + 3.16	17.170
	19	28.105	14.010 + 3.40	17.410
	40	28.305	14.010 + 3.60	17.610

FREQUENCY CHANNEL CHART						
5 BAND VERSION	(NONE)	A BAND	B BAND	C BAND	D BAND	E BAND
6 BAND VERSION	A BAND	B BAND	C BAND	D BAND	E BAND	F BAND
CHANNEL						
1	25.615	26.065	26.515	26.965	27.415	27.865
2	25.625	26.075	26.525	26.975	27.425	27.875
3	25.635	26.085	26.535	26.985	27.435	27.885
4	25.655	26.105	26.555	27.005	27.455	27.905
5	25.665	26.115	26.565	27.015	27.465	27.915
6	25.675	26.125	26.575	27.025	26.475	27.925
7	25.685	26.135	26.585	27.035	27.485	27.935
8	25.705	26.155	26.605	27.055	27.505	27.955
9	25.715	26.165	26.615	27.065	27.515	27.965
10	25.725	26.175	26.625	27.075	27.525	27.975
11	25.735	26.185	26.635	27.085	27.535	27.985
12	25.755	26.205	26.655	27.105	27.555	28.005
13	25.765	26.215	26.665	27.115	27.565	28.015
14	25.775	26.225	26.675	27.125	27.575	28.015
15	25.785	26.235	26.685	27.135	27.585	28.025
16	25.805	26.255	26.705	27.155	27.605	28.035
17	25.815	26.265	26.715	27.165	27.615	28.055
18	25.825	26.275	26.725	27.175	27.625	28.065
19	25.835	26.285	26.735	27.185	27.635	28.075
20	25.855	26.305	26.755	27.205	27.655	28.085
21	25.865	26.315	26.765	27.215	27.665	28.105
22	25.875	26.325	26.775	27.225	27.675	28.115
23	25.905	26.355	26.805	27.255	27.705	28.155
24	25.885	26.335	26.785	27.235	27.685	28.135
25	25.895	26.345	26.795	27.245	27.695	28.145
26	25.915	26.365	26.815	27.265	27.715	28.165
27	25.925	26.375	26.825	27.275	27.725	28.175
28	25.935	26.385	26.835	27.285	27.735	28.185
29	25.945	26.395	26.845	27.295	27.745	28.195
30	25.955	26.405	26.855	27.305	27.755	28.205
31	25.965	26.415	26.865	27.315	27.765	28.215
32	25.975	26.425	26.875	27.325	27.775	28.225
33	25.985	26.435	26.885	27.335	27.785	28.235
34	25.995	26.445	26.895	27.345	27.795	28.245
35	26.005	26.455	26.905	27.355	27.805	28.255
36	26.015	26.465	26.915	27.365	27.815	28.265
37	26.025	26.475	26.925	27.375	27.825	28.275
38	26.035	26.485	26.935	27.385	27.835	28.285
39	26.045	26.495	26.945	27.395	27.845	28.295
40	26.055	26.505	26.955	27.405	27.855	28.305

Galaxy Saturn Block Diagram/Flo-Chart

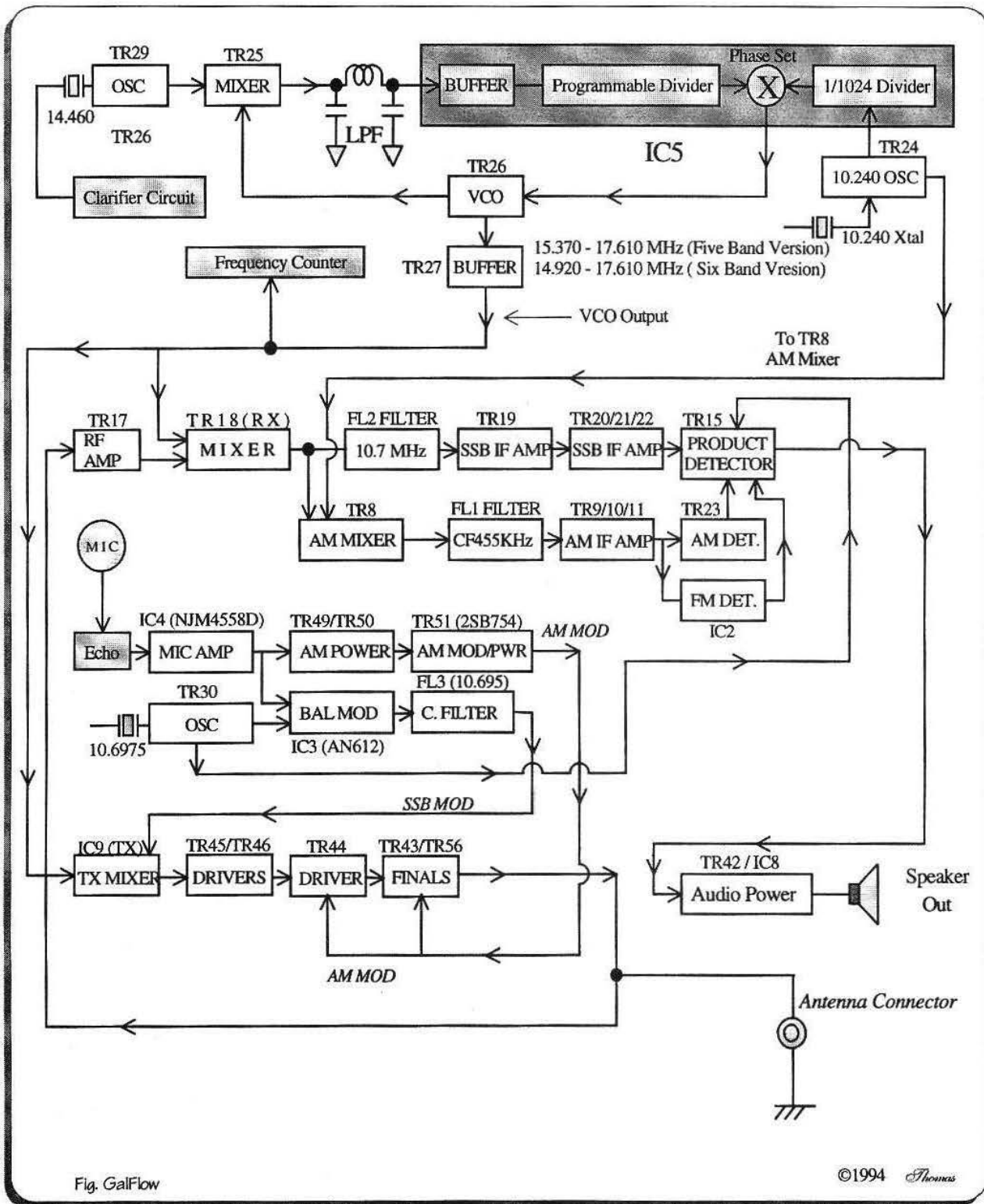


Fig. GalFlow

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Alignment Procedure

Synthesizer Alignment			
TEST EQUIPMENT TO USE & CONNECTION	RADIO SETTINGS Channel Mode Clarifier Pos.	INSTRUCTIONS	
Input of frequency counter to the junction of C78 and C79		Check for 10 2400 $\pm$ 20Hz	
Input of frequency counter to TP6 (Anode of D27)	CW	Adjust L26 for 10.6950 MHz $\pm$ 0, -100Hz	
Input of Frequency counter to TP6 (Anode of D27)	USB	Adjust L27 for 10.6925 MHz $\pm$ 0, -100Hz	
Input of frequency counter to TP6 (Anode of D27)	LSB	Adjust L28 For 10.6975 MHz $\pm$ 0, -100Hz	
Input of Oscilloscope to TP4 (Junction of C82, R107 & L46)	(5 Band Version) 19 C Band AM (6 Band Version) 19 D Band AM	Adjust L16 for maximum RF output	
Input of Oscilloscope to TP3 (Jumper J58)	(5 Band Version) 40 E Band AM (6 Band Version) 40 F Band AM	Adjust L18 for maximum RF output.	
Connect DC volt meter to TP2 (Junction of R109 and C81)	(5 Band Version) 40 E Band AM (6 Band Version) 40 F Band AM	Adjust L17 for 5.0 V $\pm$ 0.1V Check Ch17 A Band, must be 1.5V minimum	
Connect Frequency counter to TP3 (Jumper J58)	(5 Band Version) 19 C Band AM (6 Band Version) 19 D Band AM	Center	Adjust L19 for 16.490 MHz $\pm$ 50Hz
(Same as Above)	(5 Band Version) 19 C Band USB (6 Band Version) 19 D Band USB	Center	Adjust L20 for 16.4925 MHz $\pm$ 50Hz
(Same as Above)	(5 Band Version) 19 C Band LSB (6 Band Version) 19 C Band LSB	Center	Adjust L21 for 16.4875 MHz $\pm$ 50Hz

Receiver Alignment			
Connect a AC Volt Meter or Metered Dummy Load across the speaker terminals for measurement.			
TEST EQUIPMENT TO USE & CONNECTION	RADIO SETTINGS Channel Mode Clarifier Pos.	INSTRUCTIONS	
Connect signal generator to Ant input. Set to 27.185, 30% Mod, output 50 μ V.	(5 Band Version) 19 C Band AM (6 Band Version) 19 D Band AM	Center	Adjust L3, L4, L6, L7, L8, L10, L11, L12 for maximum indication on AC Volt Meter or Dummy Load.
Set signal generator to 26.186, No Modulation, output 50 μ V	(5 Band Version) 19 C Band USB (6 Band Version) 19 D Band USB	Center	Adjust L13, L14 for maximum indication on Ac Volt Meter or Dummy Load.
Set signal generator to 27.185, and apply a 1 μ V, FM signal with 1.5KHz Deviation with 1Khz audio to Ant. Input.	(5 Band Version) 19 C Band FM (6 Band Version) 19 D Band FM	Center	Readjust L5 for maximum indication on AC Volt Meter or Dummy Load.
Set signal generator to 27.185, 30% modulation, 1000 μ V.	(5 Band Version) 19 C Band AM Set squelch to full clockwise pos. (6 Band Version) 19 D Band AM Set squelch to full clockwise pos.	Center	Adjust VR4 so that the squelch just breaks. Readjust VR4 until squelch just quiets unit.

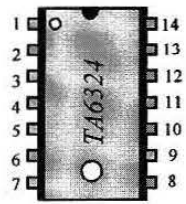
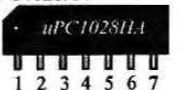
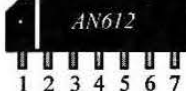
Receiver Alignment

Connect a AC Volt Meter or Metered Dummy Load across the speaker terminals for measurement.

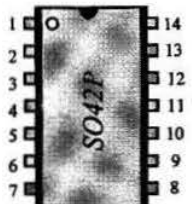
TEST EQUIPMENT TO USE & CONNECTION	RADIO SETTINGS			INSTRUCTIONS
	Channel	Mode	Clarifier Pos.	
Set signal generator to 27.185, 30% Modulation, Output 100 μ V	(5 Band Version) 19 C Band (6 Band Version) 19 D Band	AM AM AM	Center Center Center	Adjust VR1 so that the S-meter reads '9'. Then set mode selector to USB and adjust VR2 so that the S-meter again reads '9'.
Noise Blanker Adjustment Set signal generator to 27.185, No Modulation, Output 100 μ V	(5 Band Version) 19 C Band NB/ANL Switch on (6 Band Version) 19 D Band NB/ANL Switch on	AM AM AM	Center Center Center	Connect a DC volt meter to TP1 and adjust L1 and L2 to obtain a 2.5 volt ± 0.5 v reading.

Transmitter Alignment Procedure

TEST EQUIPMENT TO USE & CONNECTION	RADIO SETTINGS			INSTRUCTIONS
	Channel	Mode	Clarifier Pos.	
Connect DC mA meter to TP9 (+) and TP8 (-)	(5 Band Version) 19 C Band (6 Band Version) 19 D Band	USB USB USB		Key radio with no modulation and adjust VR11 for 20 mA ± 0.5 mA.
Connect DC mA meter to TP9 (+) and TP7 (-)	(5 Band Version) 19 C Band (6 Band Version) 19 D Band	USB USB USB		First adjust VR10 and VR20 to their minimum position (fully counter clockwise). Key radio with no modulation and adjust VR10 to 50 mA ± 5 mA and then adjust VR20 to 100mA ± 5 mA
RF Wattmeter to Antenna Connector, Key radio and Inject a 1000Hz 30mV to mike audio input (Pin 2)	(5 Band Version) 40 E Band (6 Band Version) 40 F Band	USB USB USB		Adjust VR12 and L42 for maximum RF output. Next adjust L40, L43, L44 and L33 for maximum RF output . Repeat these adjustments again. Next adjust L42 for equal power output on CH40 E Band and CH1 A Band.
RF Wattmeter to Antenna Connector Key radio and Inject a 2-tone (500Hz and 2400 Hz 30mV) audio signal to mike audio input (Pin 2)	(5 Band Version) 40 E Band (6 Band Version) 40 F Band	USB USB USB		Adjust VR12 for maximum output. <i>Be sure that you do not adjust VR12 past the 2:00 position. Doing so can cause damage to the RF outputs and / or cause severe distortion on transmit.</i>
RF Wattmeter to Antenna Connector, RF power full, Key radio.	(5 Band Version) 19 C Band (6 Band Version) 19 D Band	AM AM AM		Adjust VR13 for desired HI power AM/FM output power
RF Wattmeter to Antenna Connector, RF power set to Low (fully counter clockwise), Key radio.	(5 Band Version) 19 C Band (6 Band Version) 19 D Band	AM AM AM		Adjust VR803 for desired Low power setting on AM/FM. <i>VR803 is located on switch function selector board.</i>
RF Wattmeter to Antenna Connector,ter clockwise , Key radio.	(5 Band Version) 19 C Band (6 Band Version) 19 D Band	AM AM AM		Adjust VR8 so that the internal RF power meter reads the same as the external RF meter
Modulation Meter to Antenna Connector, Key radio and Inject a 400Hz 30mV audio signal to mike audio input (Pin 2).	(5 Band Version) 19 C Band (6 Band Version) 19 D Band	AM AM AM		Adjust VR14 for desired AM Modulation
Connect a deviation meter or a linear detector meter to antenna connector. Key radio and inject a 1000Hz 30mV audio signal to the mike audio input. (Pin 2).		FM		Adjust VR5 for 2 to 3 KHz of FM deviation
Connect a 8 Ohm dummy load and a AC Voltmeter to the external Speaker jack, and connect a key switch to the key switch jack. Key Switch to on.		CW		Adjust VR16 for a 200mv ± 10 mV reading on the AC voltmeter for CW Tone level.

IC PINOUT & VOLTAGE CHART (Voltages Taken with Radio on Channel 40 - 27.405)									
DEVICE	PINOUT	PIN	FUNCTION	AM RX	AM TX	FM RX	FM TX	SSB RX	SSB TX
IC1 TA6324 or BA10324 Squelch/ AGC Amp Substitute (None Found)	 *Some units use a B10324 IC as a direct substitute.	1 2 3 4 5 6 7 8 9 10 11 12 13 14		7.36V 0.38V 0.51V 8.62V 0V 0.06V 0.17V 0V 2.32V 0V 0V 0.31V 0.31V 0V	7.44V 1.10V 0.66V 8.59V 0V 0.12V 0V 0.80V 2.30V 0V 0V 0.29V 0.51V 0V	7.36V 1.06V 0.50V 8.62V 0V 0.20V 0V 0.80V 2.30V 0V 0V 0.29V 0.50V 0V	7.43V 1.11V 0.65V 8.59V 0V 0.20V 0V 0.80V 2.30V 0V 0V 0.27V 0.50V 0V	7.36V 1.00V 0.50V 8.62V 0V 0.09V 0.23V 0V 2.32V 0V 0V 0.30V 0.30V 0V	7.36V 0.98V 0.50V 8.62V 0V 0.02V 0.03V 0.80V 2.34V 0V 0V 0.27V 0.27V 0V
IC1 Voltages Taken in Receive Mode W/ Radio Squelched Voltages are the same for AM/FM/USB/LSB				1 = 7.4V 2 = 0.55V 3 = 0.5V 4 = 8.63V 5 = 0.04V 6 = 0.04V 7 = 0.12V		8 = 7.21V 9 = 2.36V 10 = 0V 11 = 0V 12 = 0.31V 13 = 0V 14 = 0.70V			
IC2 uPC1028HA FM IF Amp Substitute NTE-1234	 FM IF Amp 7 Lead SIP	1 2 3 4 5 6 7	Q1 Collector Q1 Base Q1 Emitter D2 Cathode D1 Anode Q2 Emitter Q2 Collector	0V 0V 0V 0V 0V 0V 0V	0V 0V 0V 0V 0V 0V 0V	1.28V 1.31V 7.41V 0V 3.23V 3.22V 4.86V	1.26V 1.24V 7.43V 0V 3.36V 3.36V 3.94V	0V 0V 0V 0V 0V 0V 0V	0V 0V 0V 0V 0V 0V 0V
IC3 AN612 Balanced Modulator Substitute NTE-1249	 Balanced Modulator 7 Lead SIP	1 2 3 4 5 6 7	Balance Control/Audio In Modulation Control Carrier In Ground DC Source Bal. Mod. Ctl Vcc (DC Supply Voltage) Modulated Carrier Output	3.10V 3.47V 3.46V 0V 6.27V 7.83V 7.97V	3.06V 3.40V 3.39V 0V 6.19V 7.65V 4.10V	0V 3.47V 3.45V 0V 6.25V 7.83V 7.97V	0V 3.40V 3.39V 0V 6.13V 7.65V 4.10V	3.10V 3.48V 3.47V 0V 6.25V 7.90V 7.97V	3.06V 3.43V 3.42V 0V 6.13V 7.73V 4.23V
IC4 MJM4558D or BA4558 Mike Amp Substitute NTE-778A	 Dual Omp Amp	1 2 3 4 5 6 7 8	Output 1 Input 1 (-) Input 1 (+) V (-) Input 2 (+) Input 2 (-) Output 2 V (+)	4.57V 4.58V 4.58V 0V 4.51V 3.33V 7.74V 8.43V	4.54V 4.54V 4.55V 0V 2.25V 3.31V 2.46V 8.38V	4.57V 4.58V 4.58V 0V 4.51V 3.33V 7.74V 8.43V	4.54V 4.54V 4.55V 0V 2.25V 3.31V 2.46V 8.38V	4.57V 4.58V 4.58V 0V 4.51V 3.33V 7.74V 8.43V	4.54V 4.54V 4.55V 0V 2.25V 3.31V 2.46V 8.38V
IC5 MC145106P (Motorola) PLL CHIP Substitute MM55106 (National)	 Phase-Locked Loop Chip 9 Bit Binary w/Internal Pull Down Resistors on P0 thru P8.	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	Vdd (Supply Voltage) F _{BI} (VCO Input) RI (10.240 Reference Osc. Input) RO (10.240 Reference Osc. Output) 1/2R (10.240 divide by 2) FS (1=10KHz Steps, 0=5 KHz Steps) PD (Phase Detector) LD (1=Locked, 0=Unlocked) P8 (Programmable Input) P7 (Programmable Input) P6 (Programmable Input) P5 (Programmable Input) P4 (Programmable Input) P3 (Programmable Input) P2 (Programmable Input) P1 (Programmable Input) P0 (Programmable Input) VSS (Ground)	7.52V 3.58V 3.8V 3.82V 3.54V 7.44V 4.71V 7.0V 0V 8.3V 8.3V 8.3V 0V 0V 0V 8.3V 0V	----- Same as AM Receive -----				

IC PINOUT & VOLTAGE CHART (Voltages Taken with Radio on Channel 40 - 27.405)

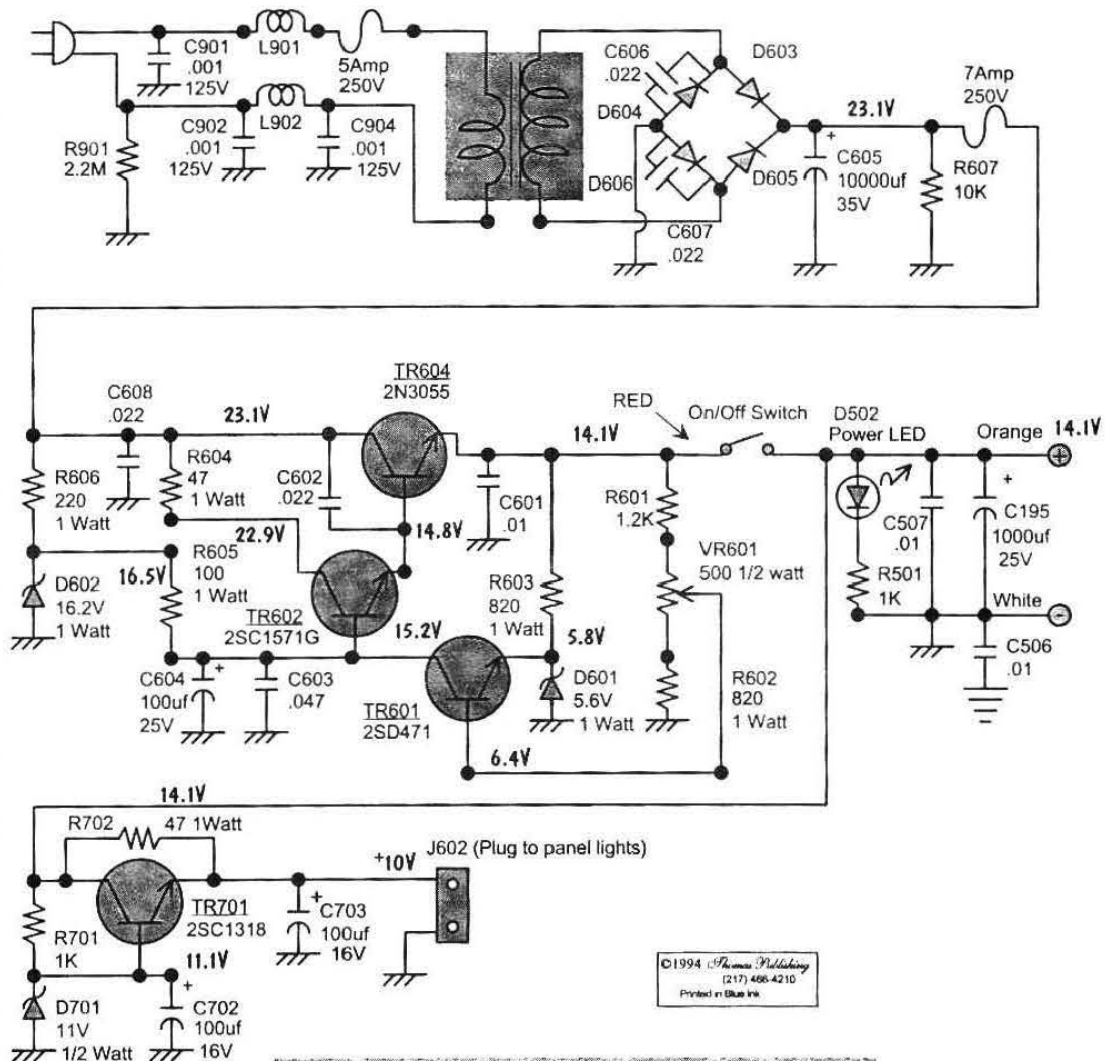
DEVICE	PINOUT	PIN	FUNCTION	AM RX	AM TX	FM RX	FM TX	SSB RX	SSB TX
IC6 MC14008B or MC14008BCB or TC4008BP PLL Adder Chip Substitute NTE-4008B	MC14008B  4-Bit Full Adder Chip w/Parallel Carry Out. 16 Pin DIP	1 A4 2 B3 3 A3 4 B2 5 A2 6 B1 7 A1 8 Vss (Ground) 9 C1 10 S1 11 S2 12 S3 13 S4 14 Co 15 B4 16 Vdd (DC Supply Voltage)	0V 0V 8.6V 8.0V 8.6V 0V 8.6V 0V 0V 8.3V 0V 0V 0V 8.6V 8.1V 8.6V	----- Same as AM Receive -----					
IC7 MC14008B or MC148BCB or 00 TC4008BP PLL Adder Chip Substitute NTE-4008B	MC14008B  4-Bit Full Adder Chip w/Parallel Carry Out. 16 Pin DIP	1 A4 2 B3 3 A3 4 B2 5 A2 6 B1 7 A1 8 Vss (Ground) 9 C1 10 S1 11 S2 12 S3 13 S4 14 Co 15 B4 16 Vdd (DC Supply Voltage)	8.6V 8.6V 0V 0V 0V 8.1V 0V 0V 8.6V 0V 8.3V 8.3V 8.3V 0V 0V 8.6V	----- Same as AM Receive -----					
IC8 TA7222P AUDIO IC Substitute NTE-1278	TA7222AP  5.8 Watt Audio Power Amp	1 Vcc (DC Supply Voltage) 2 Ripple Filter 3 Muting Control 4 Input 5 Feedback 6 Ground 7 Ground 8 Ground 9 Output 10 Bootstrap	13.9V 6.7V 0V 0V 1.13V 1.13V 0V 0V 0V 7V 13.4V	13.9V 6.7V 0V 0.56V 2.23V 2.23V 0V 0V 0V 0V 11.7V	SAME AS AM RECEIVE	SAME AS AM TRANSMIT	SAME AS AM RECEIVE	SAME AS AM TRANSMIT	
IC9 SO42P TRANSMIT MIXER IC Substitute N/A Uniden Part No. 2000-034 Cobra Part No. 307-143-9-004	SO42P 	1 Ground 2 Output ¹ 3 Output ¹ 4 Ground 5 Output ¹ Tap 6 Ground 7 Input ¹ 8 Input ¹ 9 Ground 10 Bootstrap 11 Input ² 12 Bootstrap 13 Input ² 14 Ground	0V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0V	0V 8.1V 8.1V 0V 8.0V 0V 2.9V 2.9V 0V 1.16V 1.44V 1.16V 1.44V 0V	SAME AS AM RECEIVE	SAME AS AM TRANSMIT	SAME AS AM RECEIVE	SAME AS AM TRANSMIT	

TRANSISTOR PINOUT & VOLTAGE CHART									
DEVICE	PINOUT	REMARKS	PIN	AM RX	AM TX	FM RX	FM TX	SSB RX	SSB TX
TR1 NB Amp	 2SC1675L		E C B	1.1V 8.2V 1.9V		1.1V 8.2V 1.9V		1.1V 8.2V 1.9V	
TR2 NB Amp	 2SC1675L		E C B	0V 2.5V 0.7V		0V 2.5V 0.7V		0V 2.5V 0.7V	
TR3 NB Amp	 2SC1730L		E C B	1.8V 8.2V 2.4V		1.8V 8.2V 2.5V		1.8V 8.2V 2.5V	
TR4 NB AGC	 2SC945AQ		E C B	1.1V 8.5V 0V		1.1V 8.6V 0V		1.1V 8.6V 0V	
TR5	 2SC945AQ		E C B	0V 8.0V 0V	0V 0.6V 0V	0V 8.0V 0V	0V 0.5V 0V	0V 8.0V 0V	0V 0.5V 0V
TR6 NB AMP	 2SA733P		E C B	8.6V 0V 8.0V	0V 0V 0.4V	8.6V 0V 8.0V	0V 0V 0.4V	8.6V 0V 8.0V	0V 0V 0.4V
TR7 NB Shunt SW.	 2SC945AQ		E C B	0V 0V 0V					
TR8 2nd Receive Mixer	 2SC1674L		E C B	0.1V 8.2V 0.7V	0.7V 0V 0V	0.1V 8.2V 0.7V	0.7V 0V 0V	0.7V 8.6V 0.7V	0.7V 0V 0V
TR9 AM/FM IF Amp	 2SC1675L		E C B	0V 3.2V 0.7V	0V 0V 0.7V	0V 3.2V 0.7V	0V 0V 0.7V	0V 3.2V 0.7V	0V 0V 0.7V
TR10 AM/FM IF AMP	 2SC1675L		E C B	2.6V 7.7V 3.3V		2.6V 7.7V 3.3V		0V 8.7V 0V	
TR11 AM/FM IF AMP	 2SC1675L		E C B	1.8V 7.5V 2.5V		1.8V 7.5V 2.5V		0V 8.7V 0V	
TR12 SSB AGC Timing	 2SC945AQ		E C B					0V 0V 0.7V	0V 0V 0.7V
TR13 AM/FM "S" METER Switch	 2SC945AQ		E C B	0V 0V 0.7V	0V 0V 0.7V	0V 0V 0.7V	0V 0V 0.7V	0V 0V 0V	0V 0V 0V
TR14 SSB/CW "S" METER Switch	 2SC945AQ		E C B	0V 0V 0V	0V 0V 0V	0V 0V 0V	0V 0V 0V	0V 0V 0.7V	0V 0V 0.7V
TR15 SSB Detector/AF PREAMP	 2SC945AQ		E C B	0.7V 5.5V 1.3V	0.7V 5.5V 1.3V	0.7V 5.5V 1.3V	0.7V 5.5V 1.3V	0.7V 5.4V 1.3V	0.7V 5.4V 1.3V
TR16 SQUELCH Switch	 2SC945AQ	* Squelch Open, Fully Counterclockwise	E C B	0V 0V 0V	0V 0V 0.8V	0V 0V 0V	0V 0V 0.8V	0V 0V 0V	0V 0V 0.8V
TR17 1st RF AMP	 2SC1674L		E C B	1.5V 8.2V 2.2V		1.5V 8.2V 2.2V		1.5V 8.2V 2.2V	
TR18 1st Receive Mixer	 J310 - JFET		G D S	0V 8.5V 2.2V		0V 8.5V 2.2V		0V 8.5V 2.2V	
TR19 SSB/CW IF AMP	 2SC1674L		E C B	0V 0V 0.8V	7.7V 2.2V 3.0V	0V 0V 0.8V	7.7V 2.2V 3.0V	0.8V 6.8V 1.7V	7.7V 7.0V 3.0V

TRANSISTOR PINOUT & VOLTAGE CHART										
DEVICE	PINOUT	REMARKS	PIN	AM RX	AM TX	FM RX	FM TX	SSB RX	SSB TX	
TR20 SSB/CW IF AMP	 2SC1675L		E C B	0V 2.0V 0.5V	0V 0V 0V	0V 2.0V 0.5V	0V 0V 0V	0V 3.8V 0.7V	0V 0V 0V	
TR21 SSB/CW IF AMP	 2SC1675L		E C B	1.2V 1.2V 2.0V	0V 1.9V 0V	1.1V 1.2V 2.0V	0V 1.9V 0V	3.0V 6.4V 3.7V	0V 7.0 0V	
TR22 SSB/CW IF AMP	 2SC1730L		E C B	0.5V 8.4V 1.1V	0V 0V 0V	0.5V 8.4V 1.1V	0V 0V 0V	2.2V 7.6V 3.0V	0V 0V 0V	
TR23 AM DETECTOR Switch	 2SC945AQ		E C B	0V 0V 0.7V	0V 0V 0.7V	0V 0.5V 0V	0V 0V 0V	0V 0.5V 0V	0V 0V 0V	
TR24 10.240 MHz Oscillator	 2SC1675L		E C B	1.0V 3.9V 1.6V	--- Same as AM Receive ---					
TR25 PLL LOOP MIXER	 2SC1675L		E C B	1.7V 7.0V 2.5V	--- Same as AM Receive ---					
TR26 VCO	 2SC1675L		E C B	1.4V 7.5V 2.2V	--- Same as AM Receive ---					
TR27 VCO BUFFER	 2SC1675L		E C B	0V 4.7V 0.7V	--- Same as AM Receive ---					
TR29 PLL LOOP Oscillator	 2SC1674L		E C B	2.1V 6.6V 2.9V	--- Same as AM Receive ---					
TR30 Carrier Oscillator	 2SC1675L		E C B	0V 0V 0V	2.7V 7.2V 3.4V	0V 0V 0V	2.7V 7.2V 3.4V	2.5V 6.6V 3.2V	2.7V 7.2V 3.4V	
TR31 SSB Switch	 2SC945AQ		E C B	0V 0V 0.7V	0V 0V 0.7V	0V 0V 0.7V	0V 0V 0.7V	0V 0.31V 0V	0V 0.31V 0V	
TR32 AMC Shunt Switch	 2SC945AQ		E C B	0V 0V 0.7V	0V 0V 0.1V	0V 0V 0.7V	0V 0V 0.1V	0V 0V 0.7V	0V 0V 0.1V	
TR33 Roger Beep Oscillator	 2SC945AQ		E C B	0V 0V 0V	0V 0.7V 0.5V	0V 0V 0V	0V 0.7V 0.5V	0V 0V 0V	0V 0.7V 0.5V	
TR34 AMC AMP	 2SA733P		E C B	8.7V 8.5V 8.1V	8.6V 0.6V 8.0V					
TR35 CW Sidetone Oscillator	 2SC945AQ	* CW MODE	E C B	8.0V 0V 0V	7.9V 0V 0V					
TR36 RX Voltage Switch	 2SB525-C	Some models use a 2SA1282 for TR36. The Emitter and Base are reversed.	E C B	8.7V 8.7V 8.0V	8.6V 0V 8.1V	8.7V 8.7V 8.0V	8.6V 0V 8.1V	8.7V 8.7V 8.0V	8.6V 0V 8.1V	
TR37 RX Voltage Switch	 2SC945AQ		E C B	0V 0.1V 0.7V	0V 8.1V 0V	0V 0.1V 0.7V	0V 8.1V 0V	0V 0.1V 0.7V	0V 8.1V 0V	
TR38 TX Voltage Switch	 2SB525-C	Some models use a 2SA1282 for TR38. The Emitter and Base are reversed.	E C B	8.7V 0V 8.2V	8.6V 8.6V 7.9V	8.7V 0V 8.2V	8.6V 8.6V 7.9V	8.7V 0V 8.2V	8.6V 8.6V 7.9V	
TR39 CW Switch	 2SC945AQ		E C B	0V 0V 0V	0V 2.8V 0V	0V 0V 0V	0V 2.8V 0V	0V 0V 0V	0V 2.8V 0V	

TRANSISTOR PINOUT & VOLTAGE CHART									
DEVICE	PINOUT	REMARKS	PIN	AM RX	AM TX	FM RX	FM TX	SSB RX	SSB TX
TR40 Voltage Regulator	 2SC945AQ		E C B	1.0V 13.3V 1.6V	1.0V 13.2V 1.6V	1.0V 13.3V 1.6V	1.0V 13.2V 1.6V	1.0V 13.3V 1.6V	1.0V 13.2V 1.6V
TR41 Voltage Regulator	 2SA473-O		E C B	14.0V 8.7V 13.3V	13.9V 8.7V 13.2V	14.0V 8.7V 13.3V	13.9V 8.7V 13.2V	14.0V 8.7V 13.3V	14.0V 8.7V 13.3V
TR42 AF Pre Amp	 2SC945AQ		E C B	0.6V 3.4V 1.2V	0.6V 3.4V 1.2V	0.6V 3.4V 1.2V	0.6V 3.4V 1.2V	0.6V 3.4V 1.2V	0.6V 3.4V 1.2V
TR43 RF Final AMP #1	 2SC2312 (TO-220 case style)	*Collector voltage will vary according to RF power Setting. Voltages taken at lo power setting.	E C B	0V 3.9V 0V	0V 1.5V 0.2V	0V 3.9V 0V	0V 1.5V 0.2V	0V 13.9V 0V	0V 13.9V 0.6V
TR44 RF Driver AMP	 2SC2166-C		E C B	0V 3.9V 0V	0V 1.5V 0.1V	0V 3.9V 0V	0V 1.5V 0.1V	0V 13.9V 0V	0V 13.9V 0.6V
TR45 RF Pre-Driver AMP	 2SC1973 (TO-220 case style)		E C B	0V 0V 0V	0.5V 7.0V 1.2V	0V 0V 0V	0.5V 7.0V 1.2V	0V 0V 0V	0.5V 8.5V 1.2V
TR46 TX BUFFER AMP	 2SC1906		E C B	0V 0V 0V	0.7V 6.1V 1.5V	0V 0V 0V	0.7V 6.1V 1.5V	0V 0V 0V	0.7V 6.1V 1.5V
TR47 ALC SENSE AMP	 2SC1675L		E C B	4.4V 8.1V 0V	4.3V 8.1V 0V	4.4V 8.1V 0V	4.3V 8.1V 0V	0.7V 8.1V 0V	0.7V 8.0V 0V
TR48 CW KEY Switch	 2SC945AQ		E C B	0.1V 0V 0.7V	0.1V 0V 0.7V	0.1V 0V 0.7V	0.1V 0V 0.7V	0.1V 0V 0.7V	0.1V 0V 0.7V
TR49 AM MODULATOR and REGULATOR	 2SC945AQ		E C B	3.9V 13.6V 4.4V	3.8V 12.7V 4.3V	3.9V 13.6V 4.4V	3.8V 12.7V 4.3V	13.6V 13.5V 13.0V	13.6V 13.5V 13.0V
TR50 AM MODULATOR and REGULATOR	 2SA473-O		E C B	0V 3.9V 13.6V	0V 3.7V 12.7V	0V 3.9V 13.6V	0V 3.7V 12.7V	0V 14.1V 13.6V	0V 14.1V 13.5V
TR51 AM MODULATOR and REGULATOR	 2SB754		E C B	14.1V 3.9V 13.6V	14.0V 3.7V 13.3V	14.1V 3.9V 13.6V	14.0V 3.7V 13.3V	14.1V 14.1V 13.3V	14.1V 14.0V 13.3V
TR52 SSB AUDIO Switch	 2SD471		E C B	0V 13.7V 7.6V	0V 13.3V 7.6V	0V 13.7V 0V	0V 13.6V 0V	6.9V 13.4V 7.6V	6.9V 13.3V 7.6V
TR53 AMC AMP	 2SC945AQ		E C B	1.2V 8.1V 0.8V	1.1V 8.0V 0.8V	1.2V 8.1V 0.8V	1.1V 8.0V 0.8V	4.4V 8.1V 0.8V	4.3V 8.0V 0.8V
TR54 FM AUDIO Switch	 2SC945AQ		E C B			0V 0V 0.7V	0V 0V 0.7V		
TR56 RF FINAL AMP #2	 2SC2312 (TO-220 case style)	*Collector voltage will vary according to RF power Setting. Voltages taken at lo power setting.	E C B	0V 3.9V 0V	0V 1.5V 0.2V	0V 3.9V 0V	0V 1.5V 0.2V	0V 13.9V 0V	0V 13.9V 0.6V
TR401 Light Driver	 2SC945AQ		E C B	0V 9.2V 0V	0V 0V 0.8V	0V 9.2V 0V	0V 0V 0.8V	0V 9.2V 0V	0V 0V 0.8
TR802 Light Driver	 2SD467	* CB MODE	E C B	0V 0V 0.8V	0V 0V 0.8V	0V 0V 0.8V	0V 0V 0.8V	0V 0V 0.8V	0V 0V 0.8V
		* PA MODE	E C B	0V 10.2V 0V	0V 10.2V 0V	0V 10.2V 0V	0V 10.2V 0V	0V 10.2V 0V	0V 10.2V 0V

GALAXY SATURN EPTOSSB60A Power Supply



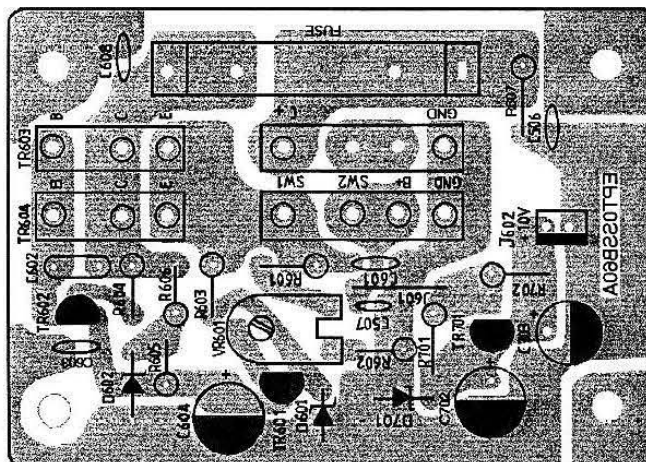
Some units may have an additional transistor like TR604 (2N3055) wired in parallel for added current capabilities. This transistor is TR603. You will notice the connections on the circuit board for this regulator.

Fig Galaxy-PS

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GALAXY SATURN
EPTOSSB60A Power Supply Board Layout

GALAXY SATURN



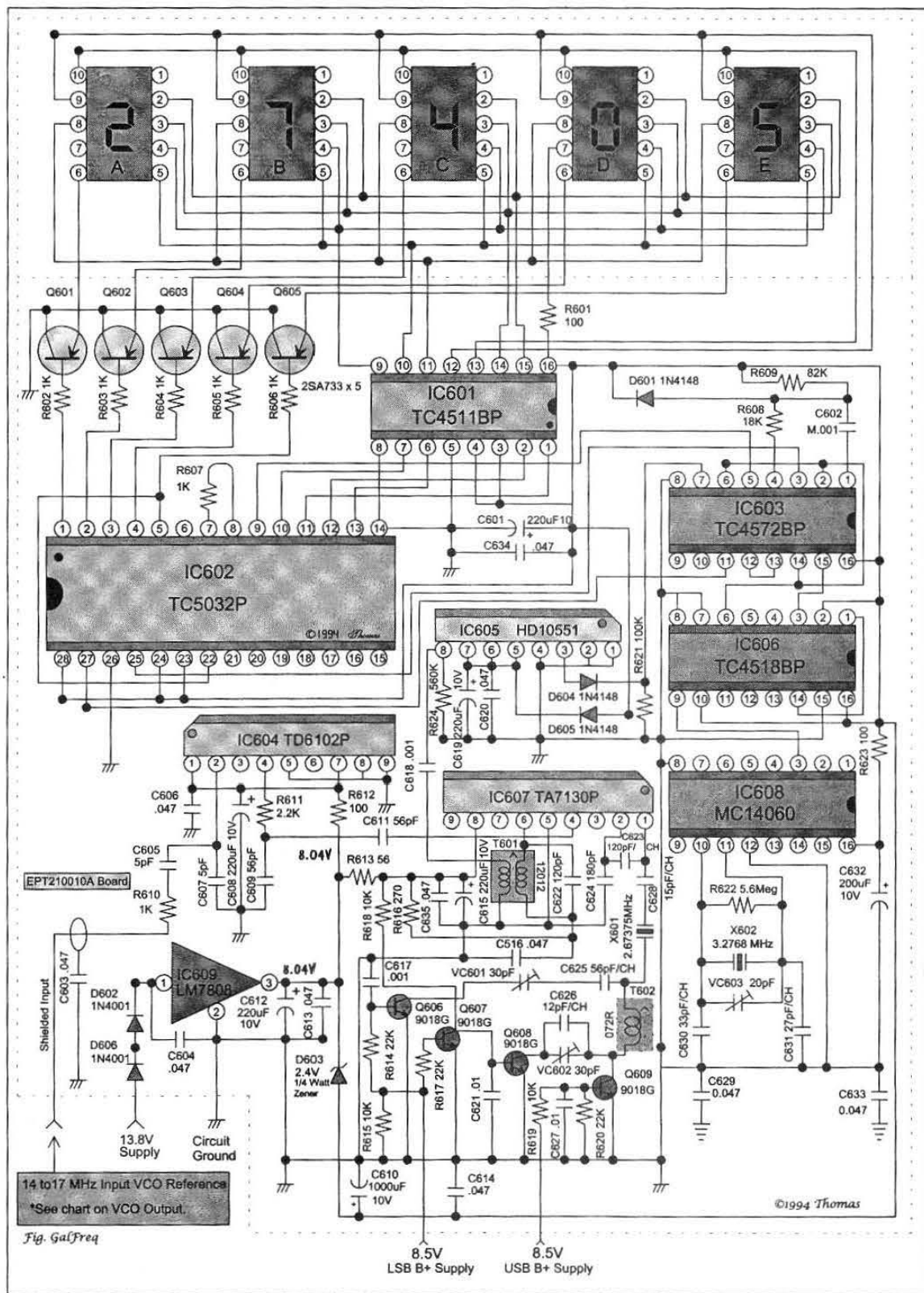
EPTOSSB60A POWER SUPPLY

Part Description	Original Number	NTE Replacement	RCA Replacement
D601 5.6V Zener 1 Watt	ZD5.6A	NTE-136A	SK5V6/136A
D602 16.2V Zener 1 Watt	ZD16.2A	NTE-5075A	SK16V/5075A
D701 11V Zener 1 Watt	ZD11V	NTE-5074A	SK11V/5074A
D603,D604,D605,D606 Bridge Rectifier	KBPC1004	NTE-5314 - 8 Amp 400PIV	SK-3987
TR604 Regulator	2N3055	NTE-130	SK-3027
TR602 Regulator	2SC1571G	NTE-199	SK-3245
TR601 Error Amp	2SD471P	NTE-293	SK-3849
TR701 Regulator	2SC1318	NTE-289A	SK-3124A

CAPACITORS	
C195	1000 μ F 25V
C506	.01 μ F 50WV
C507	.01 μ F 50WV
C601	.01 μ F 50WV
C602	.022 μ F 100WV
C603	.047 μ F 50WV
C604	100 μ F 25V
C605	10,000 μ F 35V
C606,C607	.022 μ F 100WV
C608	.022 μ F 100WV
C702	100 μ F 16V
C703	100 μ F 16V

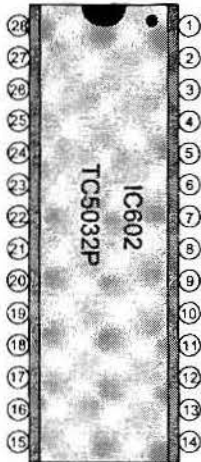
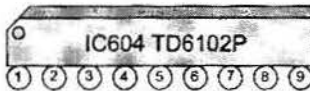
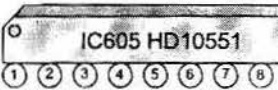
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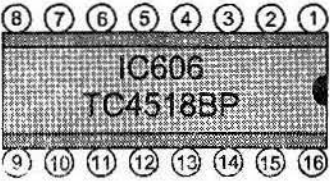
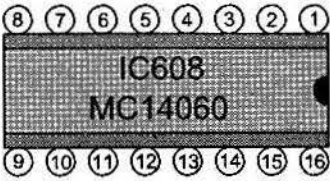
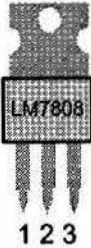
RESISTORS	
R501	1 K 1/2 Watt
R601	1.2 K 1 Watt
R602	820 Ohm 1 Watt
R603	820 Ohm 1 Watt
R604	47 Ohm 1 Watt
R605	100 Ohm 1 Watt
R606	220 Ohm 1 Watt
R607	10 K 1 Watt
R701	1 K 1/2 Watt
R702	47 Ohm 1 Watt
VR601	500 Ohm 1/2 Watt
R901	2.2Meg 1/2 Watt



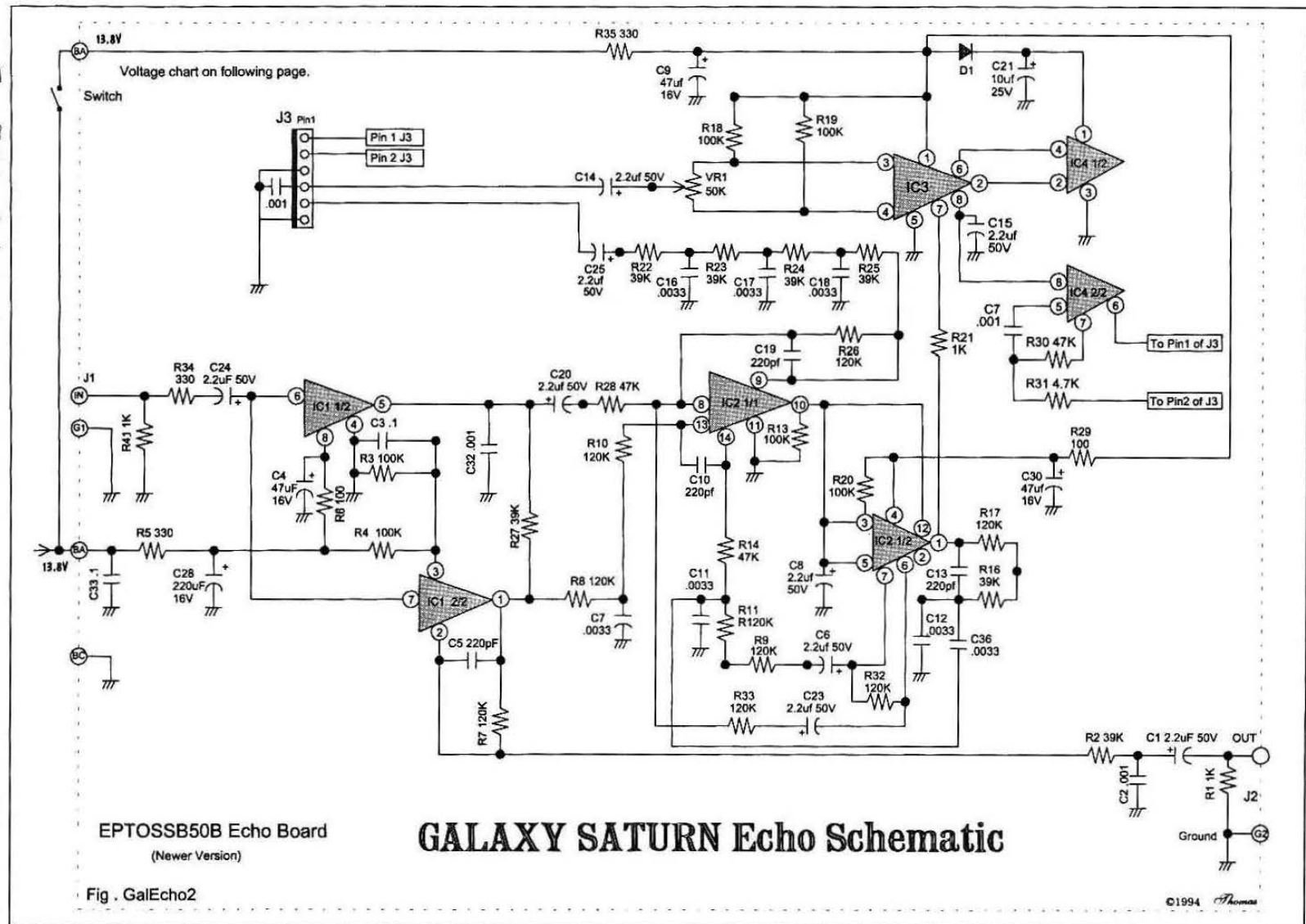
FREQUENCY COUNTER BOARD IC & TRANSISTOR PINOUT AND VOLTAGE CHART				
TRANS. / IC	Configuration	Pin	CHANNEL 40 AM	REMARKS
Q601 2SA733A-PB	 2SA733A-PB	E C B	3.1Volts 0 Volts 4.5 Volts	*Voltages taken on Channel 40 AM
Q602 2SA733A-PB	 2SA733A-PB	E C B	3.6 Volts 0 Volts 4.5 Volts	*Voltages taken on Channel 40 AM
Q603 2SA733A-PB	 2SA733A-PB	E C B	2.8 Volts 0 Volts 4.5 Volts	*Voltages taken on Channel 40 AM
Q604 2SA733A-PB	 2SA733A-PB	E C B	3.0 Volts 0 Volts 4.5 Volts	*Voltages taken on Channel 40 AM
Q605 2SA733A-PB	 2SA733A-PB	E C B	3.1 Volts 0 Volts 4.5 Volts	*Voltages taken on Channel 40 AM
Q606 9018G	 9018G	E C B	0 Volts - 0.12 Volts 0.2 Volts	*Voltages taken on Channel 40 AM
Q607 9018G	 9018G	E C B	0 Volts - 0.12 Volts 0.73 Volts	*Voltages taken on Channel 40 AM
Q608 9018G	 9018G	E C B	0 Volts 0.73 Volts 0.02 Volts	*Voltages taken on Channel 40 AM
Q609 9018G	 9018G	E C B	0 Volts - 0.09 Volts 0.37 Volts	*Voltages taken on Channel 40 AM
IC601 TC4511P		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	2.51 Volts 3.44 Volts 5.01 Volts 5.01 Volts 0 Volts 0.11 Volts 2.60 Volts 0 Volts 1.38 Volts 2.11 Volts 3.61 Volts 2.80 Volts 3.54 Volts 2.84 Volts 2.16 Volts 5.02 Volts	*Voltages taken on Channel 40 AM

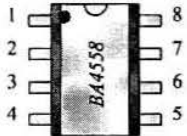
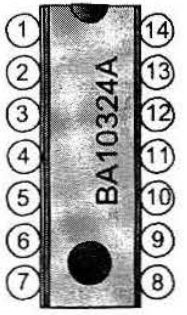
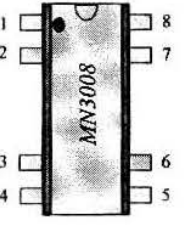
FREQUENCY COUNTER BOARD IC & TRANSISTOR PINOUT AND VOLTAGE CHART

TRANS. / IC	Configuration	Pin	CHANNEL 40 AM	REMARKS
IC602 TC5032P	TC5032P (Toshiba) 	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	4.42V 4.42V 4.42V 4.42V 4.42V 4.39V 2.38V 2.52V Fluctuating Voltage Fluctuating Voltage 2.51V 3.44V 0.11V 0V Fluctuating Voltage 4.80V to 4.94V 5.02V 5.02V 5.02V 5.02V 0V 4.42V 5.02V 5.02V 0V 0V Fluctuating Voltage 5.02V	*Voltages taken on Channel 40 AM
IC603 TC4572BP		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Fluctuating Voltage Fluctuating Voltage 0V 4.97V Fluctuating Voltage Fluctuating Voltage 4.8V 0V 0V 0.3V Fluctuating Voltage Fluctuating Voltage Fluctuating Voltage Fluctuating Voltage 2.4 - 2.62V 5.02V	*Voltages taken on Channel 40 AM
IC604 TD6102P		1 2 3 4 5 6 7 8 9	5.23V 3.08V 4.66V 3.78V 0V 4.48V 5.23V 0V 0V	*Voltages taken on Channel 40 AM
IC605 HD10551		1 2 3 4 5 6 7 8	0V 0V 2.39V 0V 4.26V 4.26V 4.26V 2.39V	*Voltages taken on Channel 40 AM

FREQUENCY COUNTER BOARD IC & TRANSISTOR PINOUT AND VOLTAGE CHART				
TRANS / IC	Configuration	Pin	CHANNEL 40 AM	REMARKS
IC606 TC4518BP		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	2.01V +/- 5.02V 2.5V Fluctuating Voltage Fluctuating Voltage Fluctuating Voltage 0V 0V 2.47V 5.02V 2.51V 2.02V 2.04V 1.02V 0V 5.02V	*Voltages taken on Channel 40 AM
IC607 TA7310P		1 2 3 4 5 6 7 8 9	2.71V 2.16V 1.48V 2.71V 0V 5.75V 2.11V 6.8V 1.35V	*Voltages taken on Channel 40 AM
IC608 MC14060		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	2.47 Volts *N/C 2.47 Volts *N/C 2.47 Volts 2.49 Volts *N/C 2.49 Volts *N/C 2.49 Volts *N/C 2.54 Volts *N/C 0 Volts 3.47 Volts *N/C 2.92 Volts 2.67 Volts 0 Volts 2.49 Volts *N/C 2.49 Volts *N/C 2.49 Volts *N/C 4.95 Volts *N/C * N/C = No Connection	* Voltages taken on Channel 40 AM
IC609 LM7808 8 Volt Regulator		1 2 3	12.41 Volts 0 Volts 8.04 Volts	*Voltages taken on Channel 40 AM

EPTOSSB50Z (Older Version) ECHO BOARD IC PINOUT AND VOLTAGE CHART			
IC	Configuration	Pin	Pin Function
IC1 AN6552 (Dual Op Amp) <i>Substitute:</i> NTE-778A ECG-778A SK-3465		1 2 3 4 5 6 7 8	Output 1 Input 1 (-) Input 1 (+) V (-) Ground Input 2 (+) Input 2 (-) Output 2 V (+)
IC2 AN6552 (Dual Op Amp) <i>Substitute:</i> NTE-778A ECG-778A SK-3465		1 2 3 4 5 6 7 8	Output 1 Input 1 (-) Input 1 (+) V (-) Ground Input 2 (+) Input 2 (-) Output 2 V (+)
IC3 AN6552 (Dual Op Amp) <i>Substitute:</i> NTE-778A ECG-778A SK-3465		1 2 3 4 5 6 7 8	Output 1 Input 1 (-) Input 1 (+) V (-) Ground Input 2 (+) Input 2 (-) Output 2 V (+)
IC4 MN3008		1 2 3 4 5 6 7 8	<i>Pin Out Info Unavailable</i>
IC5 MN3101 (IC, Clock/Generator) <i>Substitute:</i> NTE-1639 ECG-1639		1 2 3 4 5 6 7 8	Ground CP 1 Vdd CP2 OX 3 OX 2 OX 1 Vgg (Out)



EPTOSSB50B (Newer Version) ECHO BOARD IC PINOUT AND VOLTAGE CHART					
IC	Configuration	Pin	Pin Function	Ch. 40 AM Un-Keyed	Ch. 40 AM Keyed
IC1 BA4558 (Dual Op Amp) Substitute: NTE-778A ECG-778A SK-3465	<i>BA4558</i>  <i>Dual-Op Amp</i>	1 2 3 4 5 6 7 8	Output 1 Input 1 (-) Input 1 (+) V (-) Ground Input 2 (+) Input 2 (-) Output 2 V (+)	6.79V 6.80V 6.76V 0V 6.77V 6.80V 6.80V 13.26V	6.73V 6.73V 6.70V 0V 6.71V 6.73V 6.73V 13.13V
IC2 BA10324A	 <i>BA10324A</i>	1 2 3 4 5 6 7 8 9 10 11 12 13 14	Not Available	6.72V 6.73V 6.69V 13.58V 6.69V 6.73V 6.72V 6.73V 6.73V 6.69V 0V 6.69V 6.73V 6.65V	6.67V 6.67V 6.63V 13.45V 6.63V 6.67V 6.66V 6.67V 6.67V 6.63V 0V 6.63V 6.67V 6.61V
IC3 MN3008	<i>MN3008</i>  <i>MN3008</i>	1 2 3 4 5 6 7 8	Not Available	13.68V 6.53V 0V 6.53V 6.05V 6.83V 6.64V 0.87V	12.91V 6.46V 0V 6.46V 5.99V 6.76V 6.57V 0.86V
IC4 MN3101 (IC, Clock/Generator) Substitute: NTE-1639 ECG-1639	<i>MN3101</i>  <i>MN3101</i>	1 2 3 4 5 6 7 8	Ground CP 1 Vdd CP2 OX 3 OX 2 OX 1 Vgg (Out)	13.04V 6.53V 0V 6.53V 6.05V 6.83V 6.64V 0.87V	12.91V 6.46V 0V 6.46V 5.99V 6.76V 6.57V 0.86V

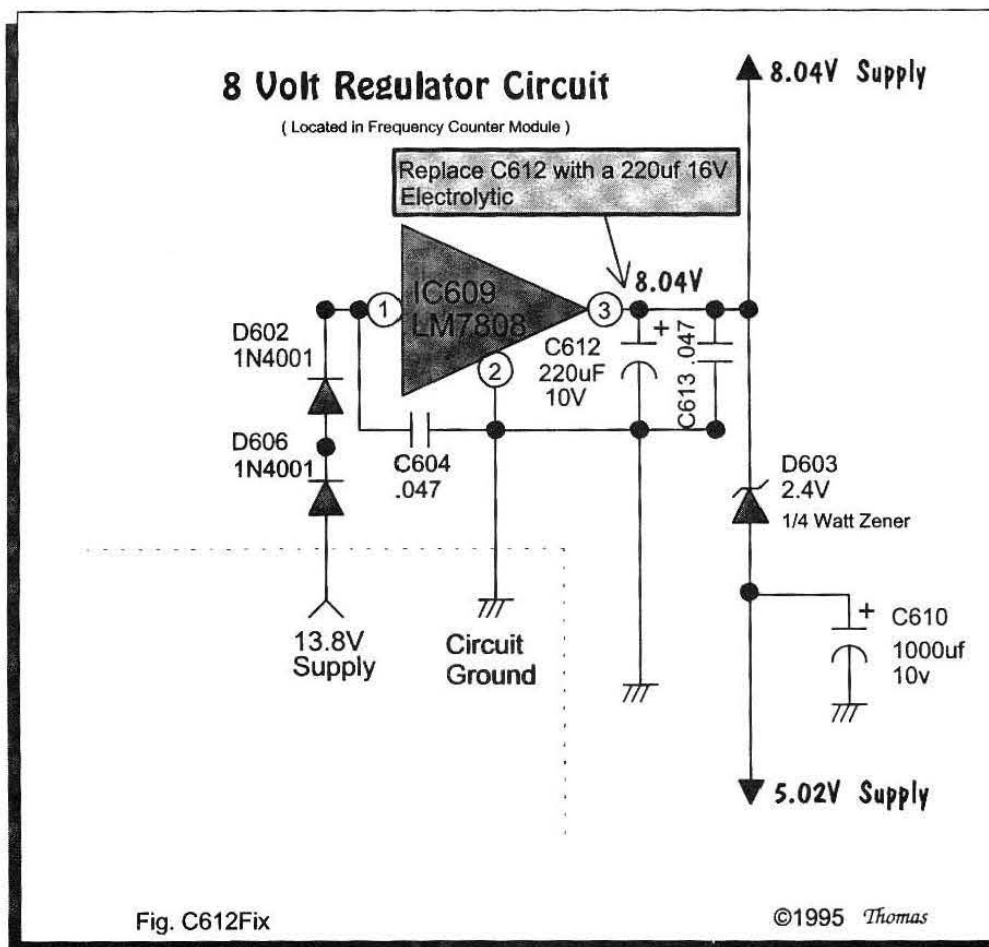
REPAIR TIP SECTION

PROBLEM: Frequency Counter does not operate.

Frequency counter has no readout or display.

CURE :

First check that the 13.8 volt supply is available and constant on pin 1 of IC609 (LM7808 regulator) . Next check for 8.04 volts on pin 3 of IC609 (LM-7808 regulator) . If this voltage is absent then IC609 is defective and will need to be replaced. After replacing IC609 and before applying power to the unit you should also replace C612 with a 200uF 16V electrolytic. Sometimes C612 - (220μf 10V electrolytic) - will develop a short, and this will cause the premature failure of IC609. This should restore normal operation and prevent future problems occurring.



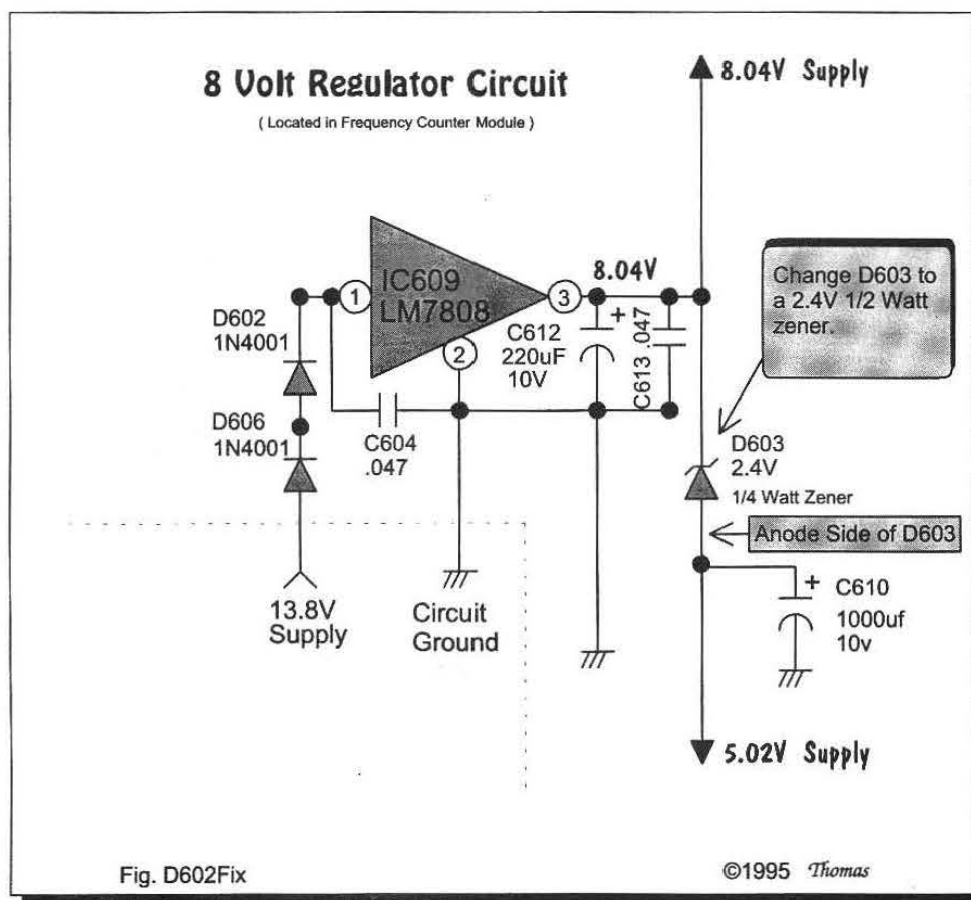
REPAIR TIP SECTION

PROBLEM: Frequency Counter unstable or no operation.

The most common problem with the GALAXY SATURN frequency counter is after it is on awhile the read-out becomes unstable. Sometimes the display will quit all together. Turning the unit off and allowing it to cool for a short period of time will usually restore correct operation. This problem has been traced to a Zener Diode inside the frequency counter module. It is marked D-603. This is a 2.4 volt, 1/4 watt zener next to IC-609 (LM-7808) regulator. This problem is also common on many other export models using the EPT210010A frequency counter board.

CURE :

First be sure that the 8 volt supply is available and constant on pin 3 of IC609 (LM7808 regulator). Next locate D-603 in the frequency counter module. Check for 5.02 volts on the anode side of D-603. If this voltage is absent or very low replace D-603 with an NTE-5000A (2.4 volt, 1/2 Watt) zener. This should restore normal operation and also prevent future problems.. We also recommend replacing C610 also. Sometimes C610 - (1000 μ f 10V electrolytic) - will develop a short, and this will cause the premature failure of D603 also.



REPAIR TIP SECTION

PROBLEM:

Distortion on SSB transmit sometimes causing premature failure of TR-51 (2SB-754).

CURE :

This problem is usually caused by having the SSB ALC adjustment turned up too high. Do not adjust VR-12 full open (11 o'clock position). Normally this adjustment should be not be turned past the 6 o'clock position.

PROBLEM:

Transmit power is very low (1 to 3 watts on AM). The Transmit Driver and Transmit Finals all test good. No amount of adjustment will improve the power level. Power is also low on SSB as well. TR44 driver bias (VR11) will not adjust.

CURE :

Replace VR11 with a new variable unit. Be sure to replace VR11 with a 1/2 watt replacement or heavier. After replacement refer to the transmit alignment section, and adjust VR11 for the proper bias voltage on TR44. This same type of symptoms can occur when the final bias adjustments become defective. However this is not as common as the failure of VR11.

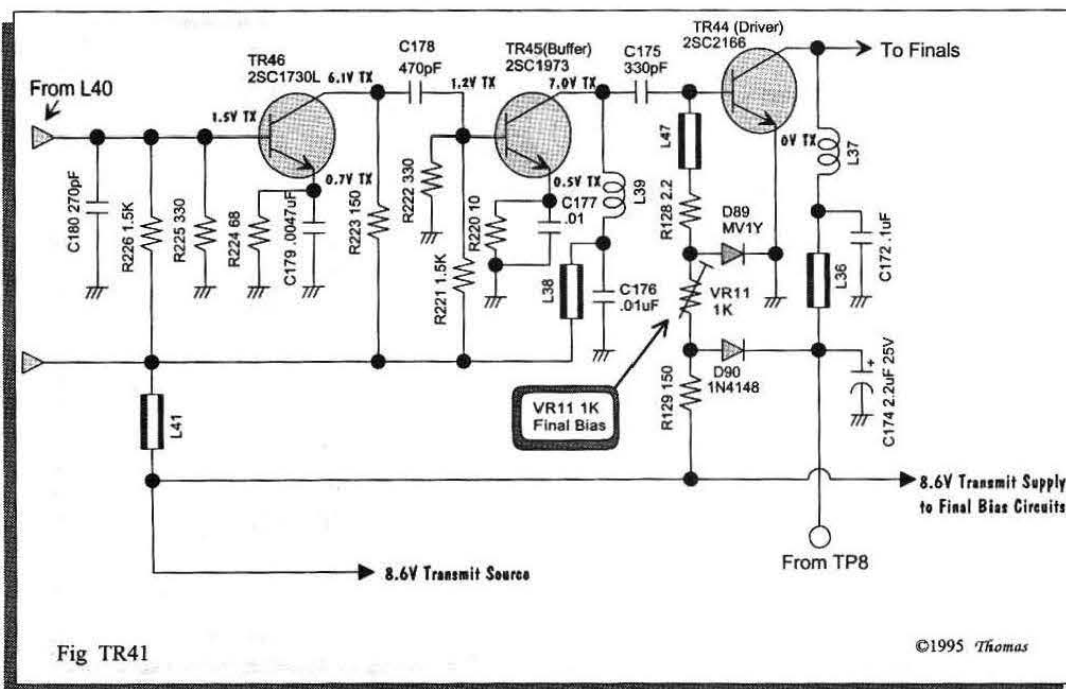


Fig TR41

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GALAXY FINAL TRANSMIT SECTION

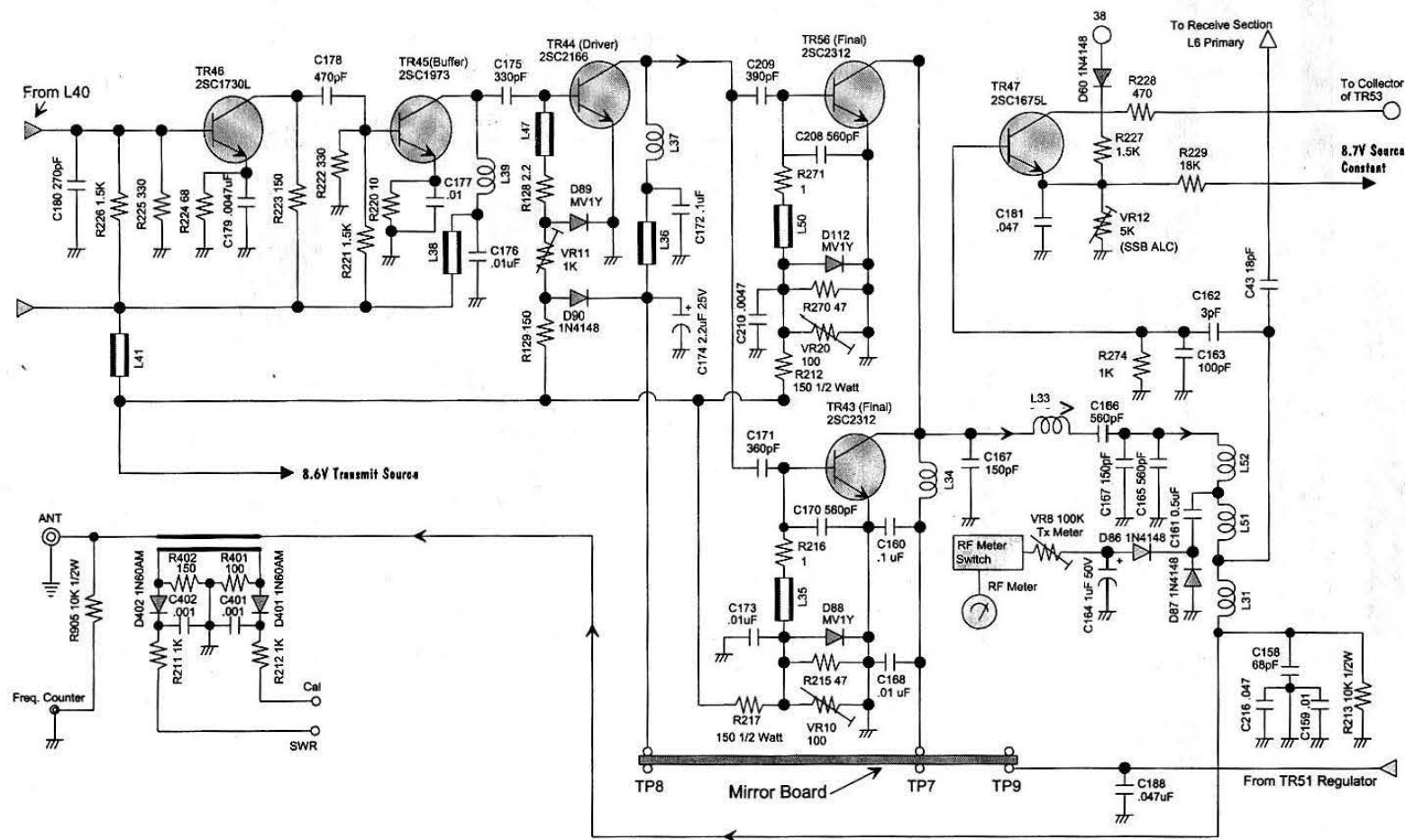


Fig. GalTx

REPAIR TIP SECTION

PROBLEM:

Loss of transmit. Transmit LED shows transmit switching but radio has no RF output. Bad TR-51 (2SB-754GR).

CURE :

This is a very common problem in this radio. The 2SB-754 seems to be some what under rated for this circuit. Replace 2SB-754 (7 Amp, 60 Watt) with an NTE-37 (12 Amp, 100 Watt). This should not only return the unit to normal operation but also help to prevent any future problems.

TR51 MODULATOR & POWER REGULATOR CIRCUIT

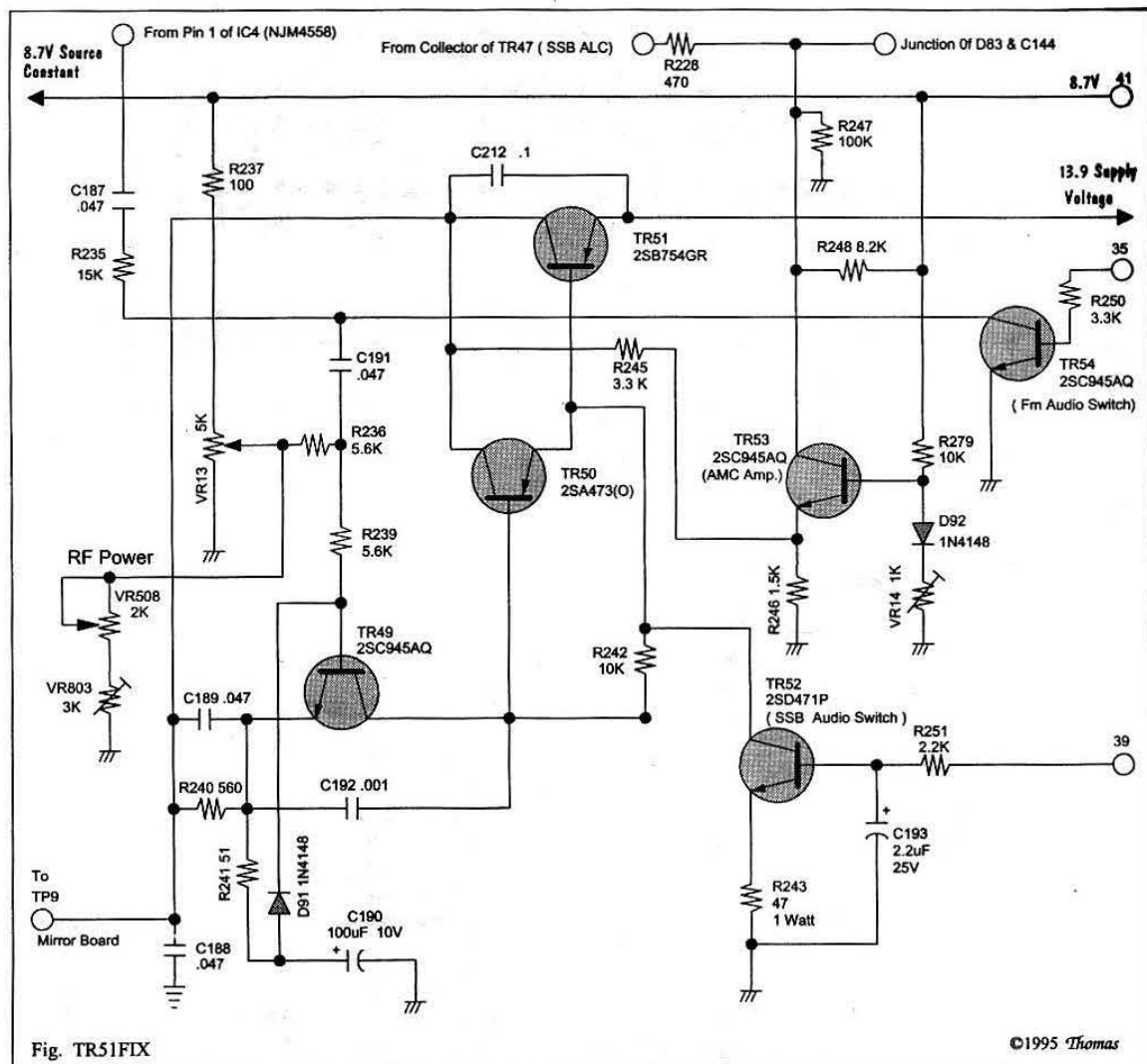


Fig. TR51FX

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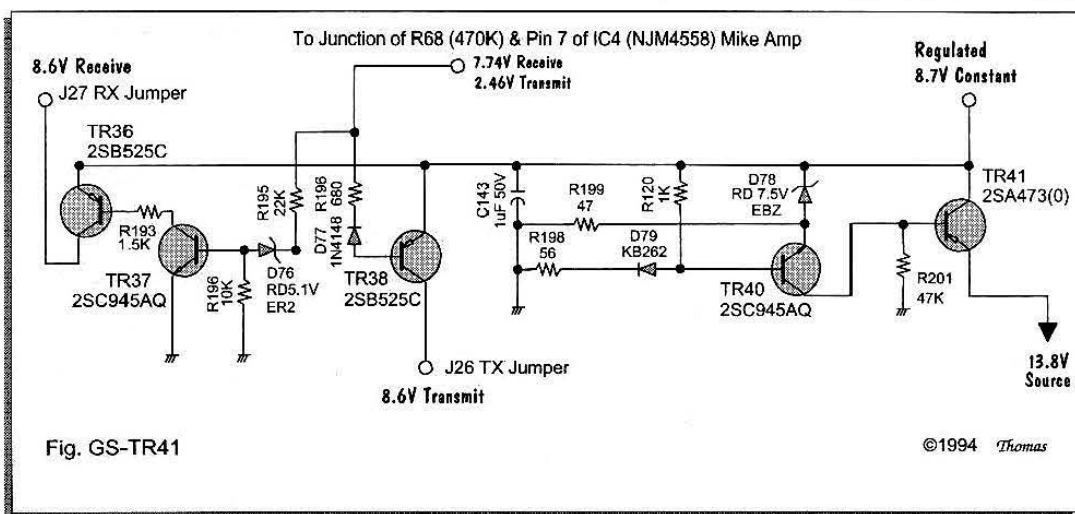
REPAIR TIP SECTION

PROBLEM:

Loss of transmit. Transmit LED does not show transmit switching and radio has no RF output.

CURE :

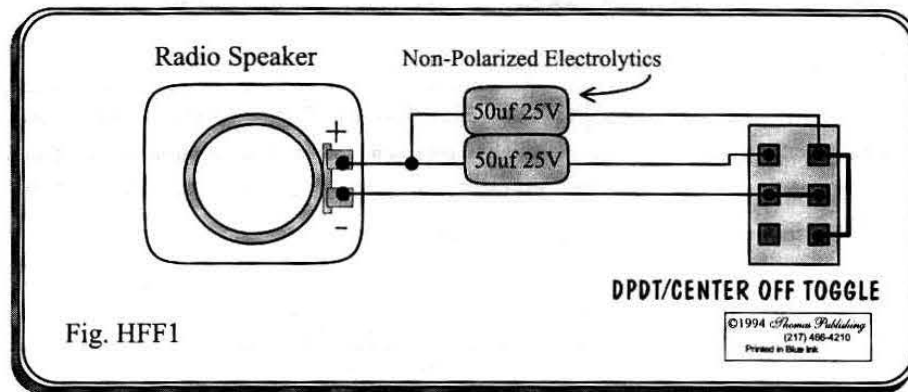
Normally this problem is caused by a defective TR38 transmit switch. Using the voltage chart below carefully check to make sure all voltages are correct on transmit and receive as shown. In some units we have found D77 to cause these same symptoms. Always be sure that the regulated 8.7 volts is present at the collector of TR41, and remains constant in both transmit and receive modes.



DEVICE	PINOUT	REMARKS	PIN	AM RX	AM TX	FM RX	FM TX	SSB RX
TR36 RX Voltage Switch	 2SB525-C	Some models use a 2SA1282 for TR38. The emitter and base are reversed.	E C B	8.7V 8.7V 8.0V	8.6V 0V 8.1V	8.7V 8.7V 8.0V	8.6V 0V 8.1V	8.7V 8.7V 8.0V
TR37 RX Voltage Switch	 2SC945AQ		E C B	0V 0.1V 0.7V	0V 8.1V 0V	0V 0.1V 0.7V	0V 8.1V 0V	0V 0.1V 0.7V
TR38 TX Voltage Switch	 2SB525-C	Some models use a 2SA1282 for TR38. The emitter and base are reversed.	E C B	8.7V 0V 8.2V	8.6V 8.6V 7.9V	8.7V 0V 8.2V	8.6V 8.6V 7.9V	8.7V 0V 8.2V
TR39 CW Switch	 2SC945AQ		E C B	0V 0V 0V	0V 2.8V 0V	0V 0V 0V	0V 2.8V 0V	0V 0V 0V
TR40 Voltage Regulator	 2SC945AQ		E C B	1.0V 13.3V 1.6V	1.0V 13.2V 1.6V	1.0V 13.3V 1.6V	1.0V 13.2V 1.6V	1.0V 13.3V 1.6V
TR41 Voltage Regulator	 2SA473-O		E C B	14.0V 8.7V 13.3V	13.9V 8.7V 13.2V	14.0V 8.7V 13.3V	13.9V 8.7V 13.2V	14.0V 8.7V 13.3V

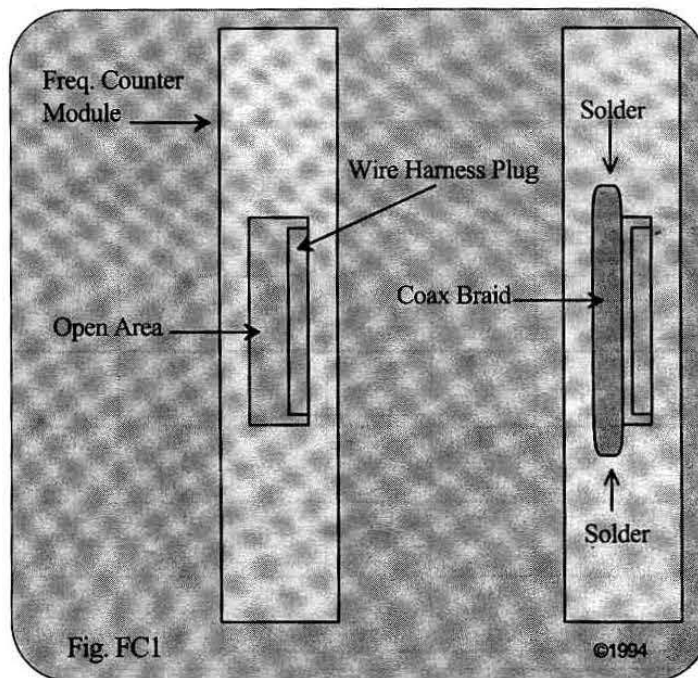
GALAXY SATURN

Eliminating Frequency Counter Noise

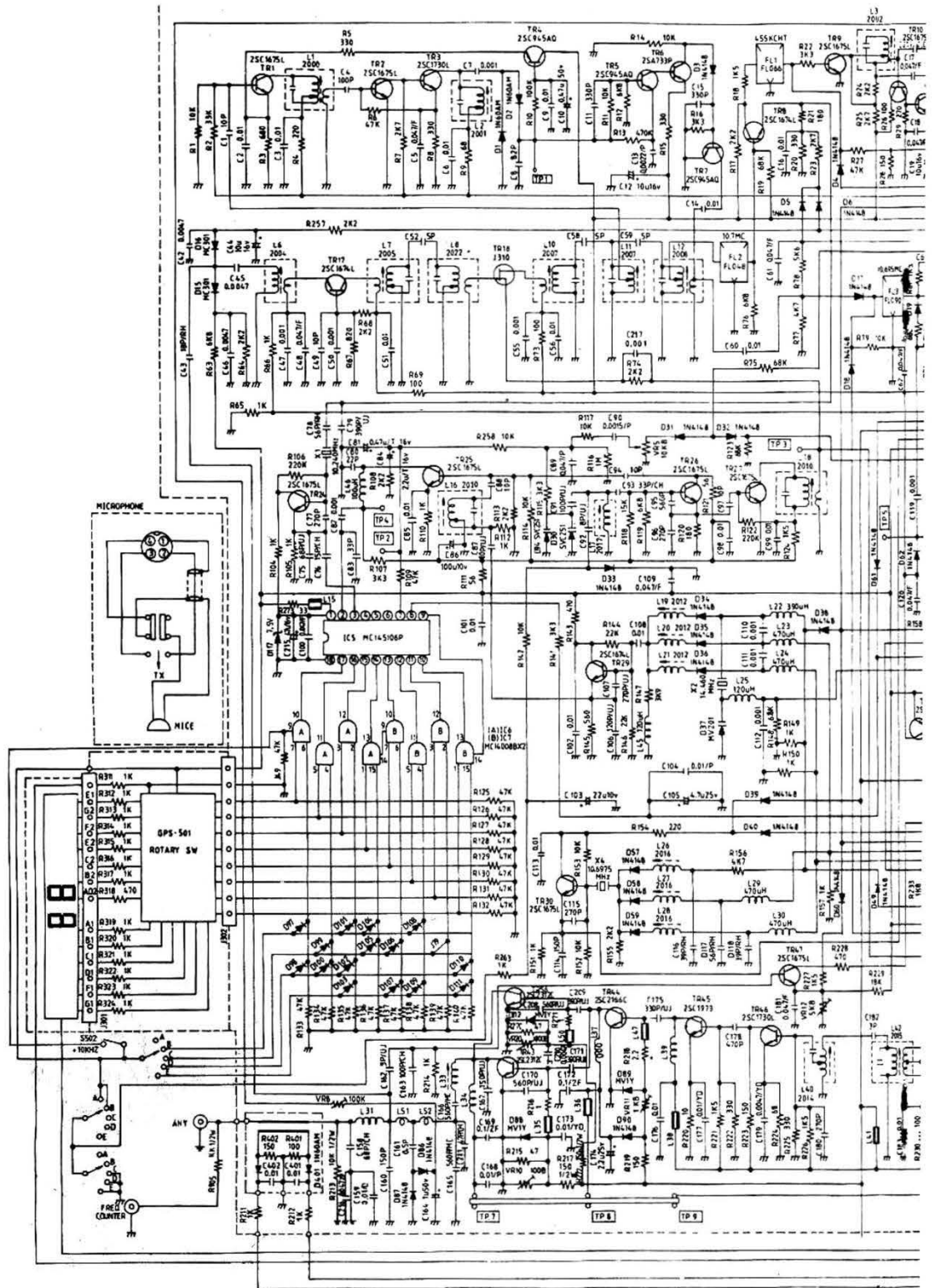


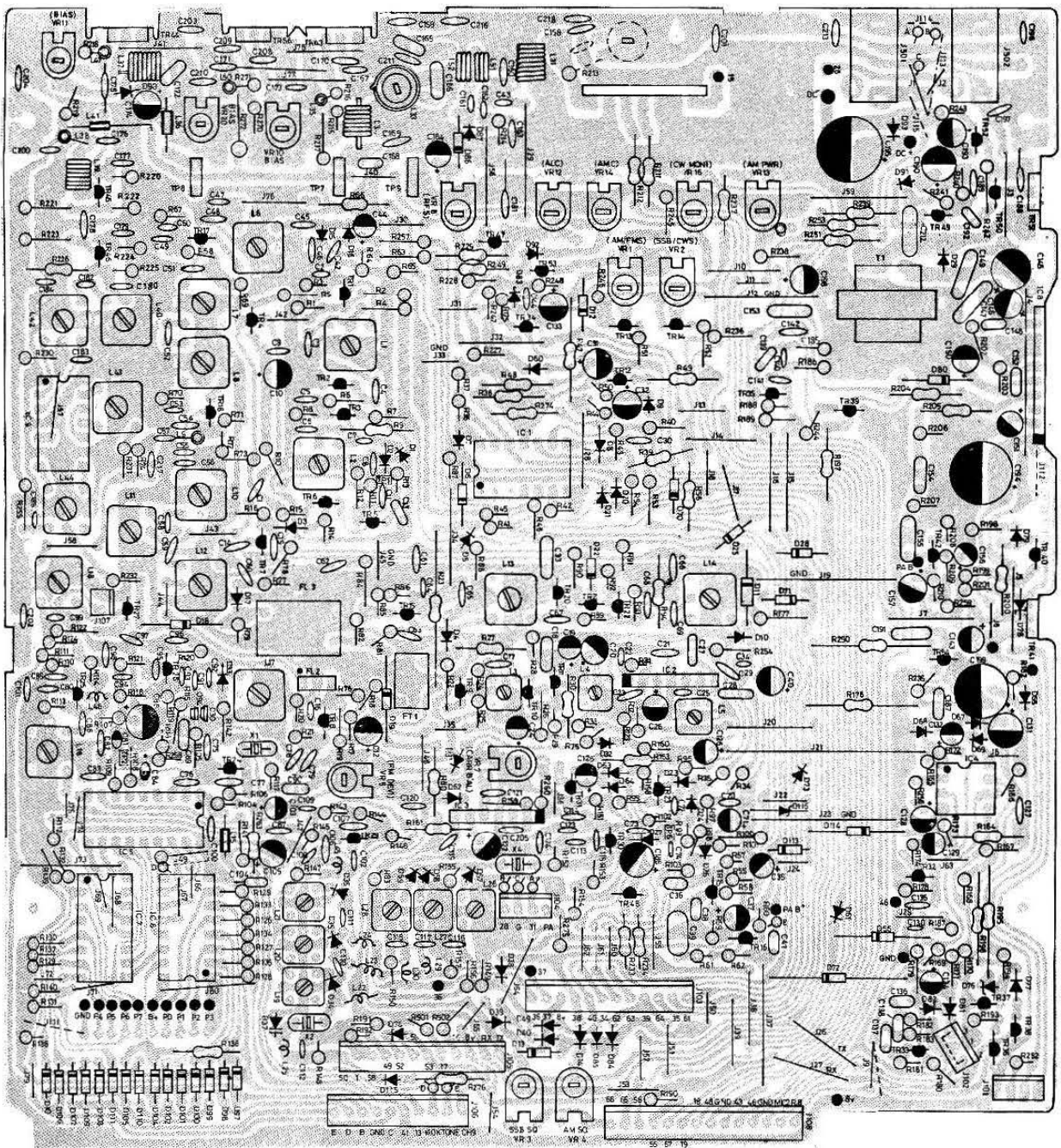
Instructions

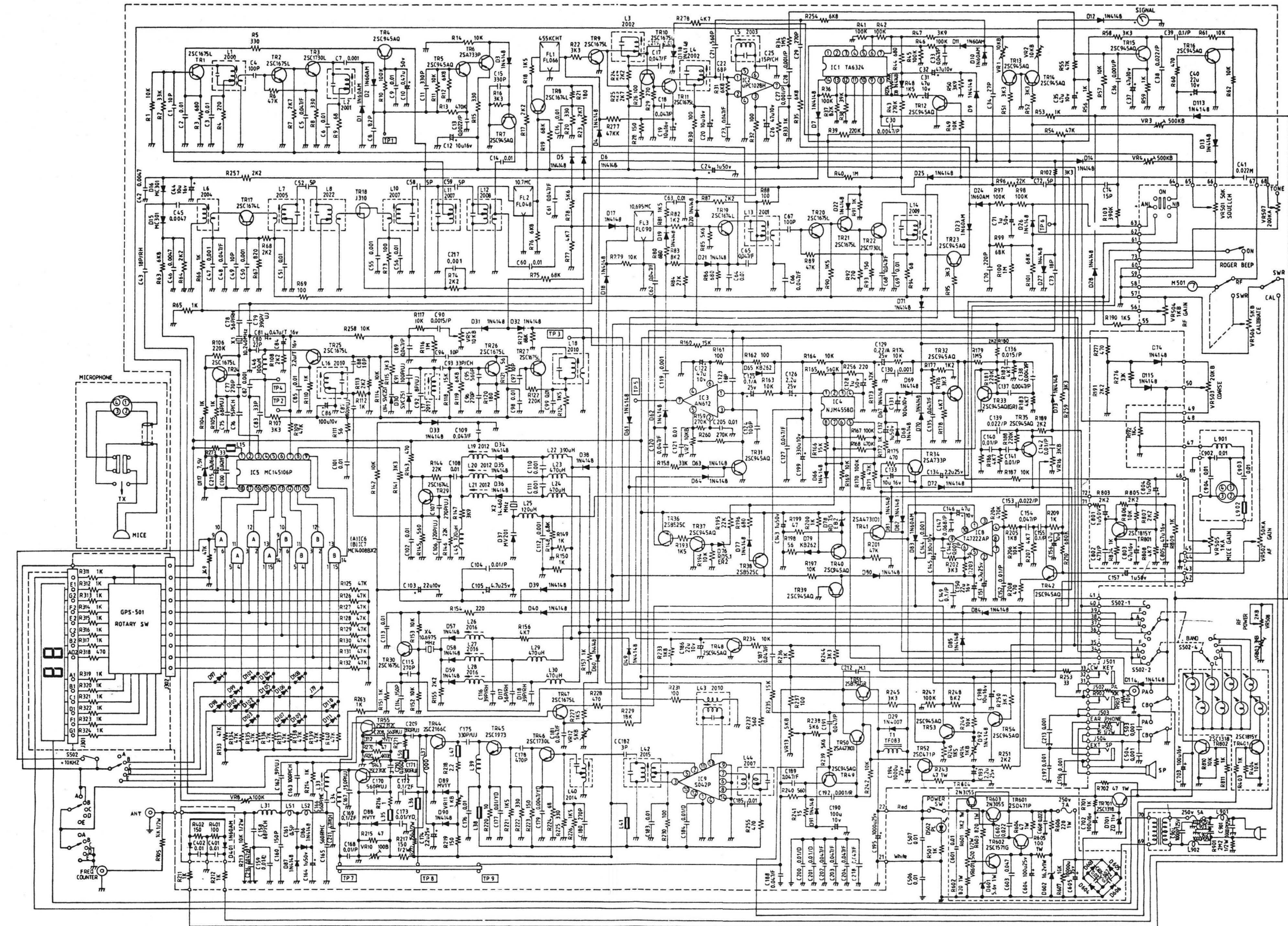
Some Galaxy Saturns tend to have a constant high pitched whine caused by the frequency counter module. Though this noise can't be heard while receiving a strong signal it is usually very prevalent while the radio is squelched. The above diagram shows a way of passing this whine to ground or at least greatly reducing it. The above filter will also greatly reduce most High-Frequency Noise and can be used on any radio for this purpose.

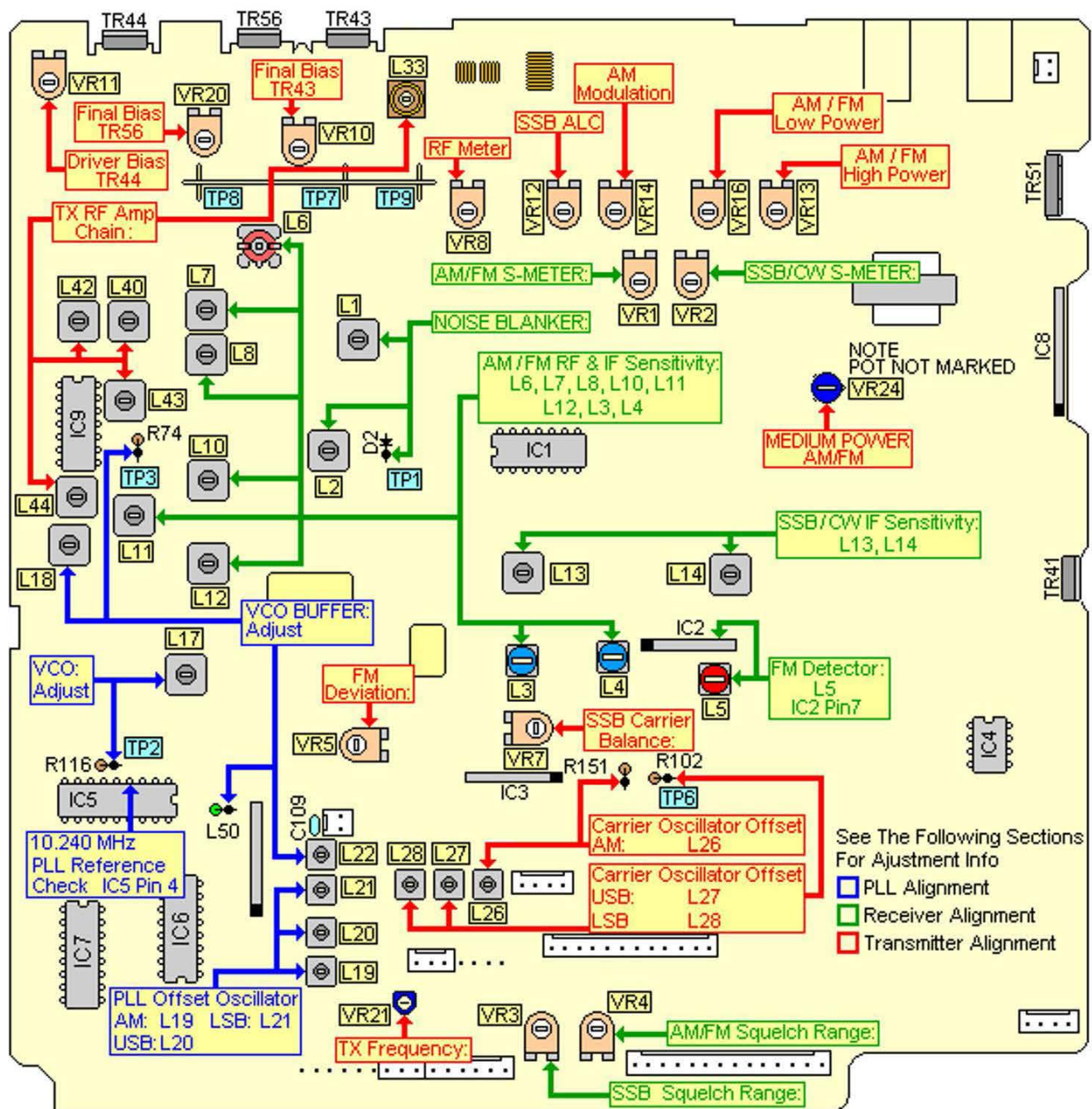


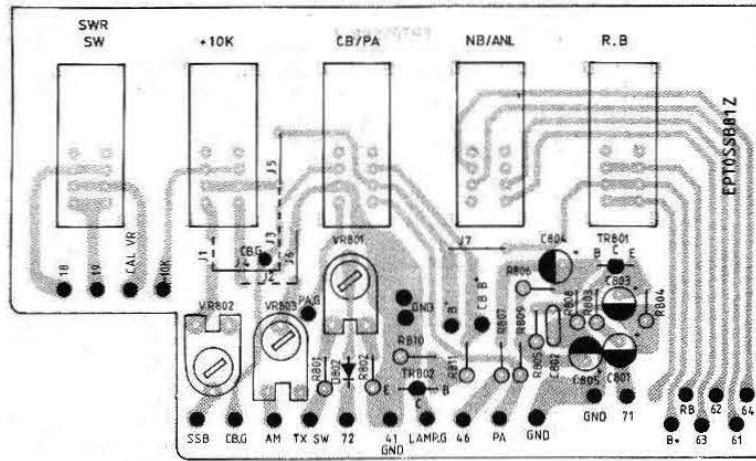
Next you will need to add additional shielding to the frequency counter module. Notice the opening just to the left of the wire harness plug. Although this opening isn't very large, it still allows a large amount of stray RF to be radiated from the module. The fix is to carefully cover this opening with a small piece of coax braid. Carefully solder each end of the coax braid to the metal can. Be sure that none of the braid touches any connections on the counter circuit board.



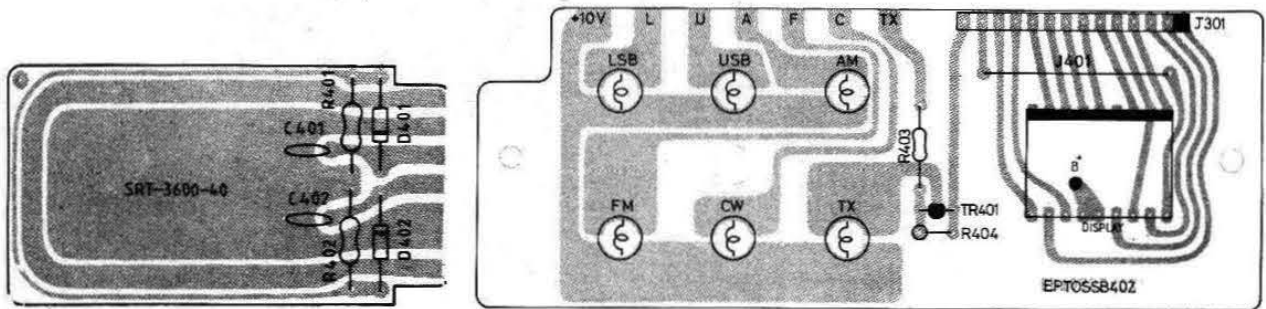






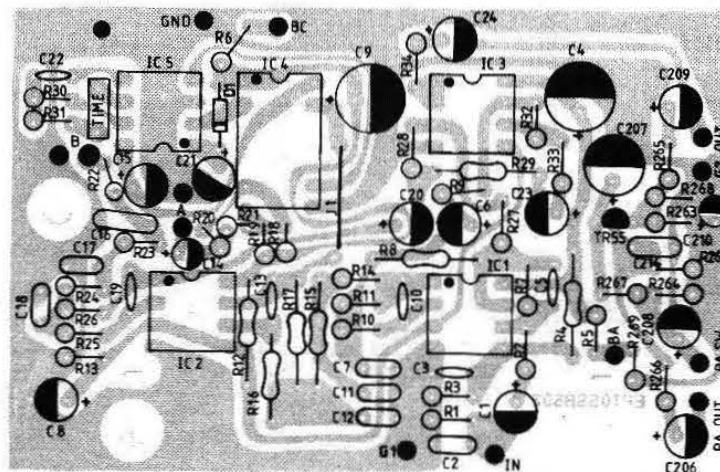


EPTOSSB81Z Function Selector

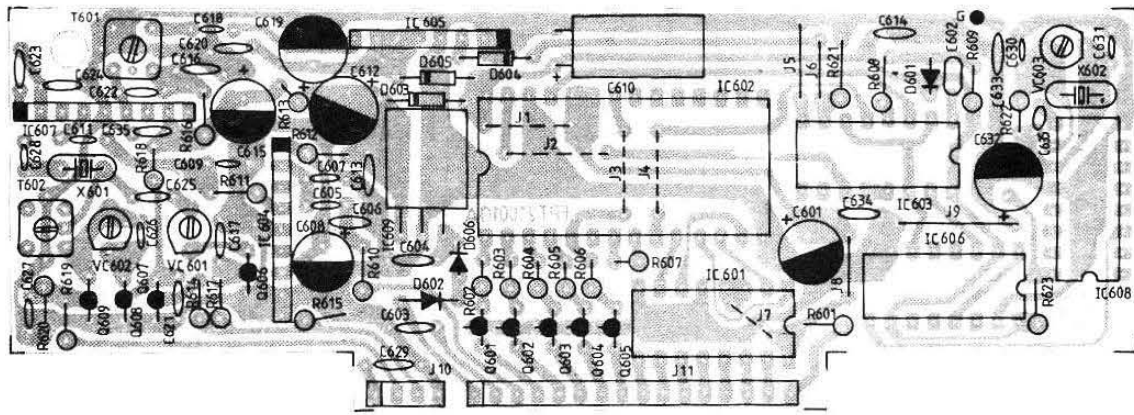


EPT360040Z SWR

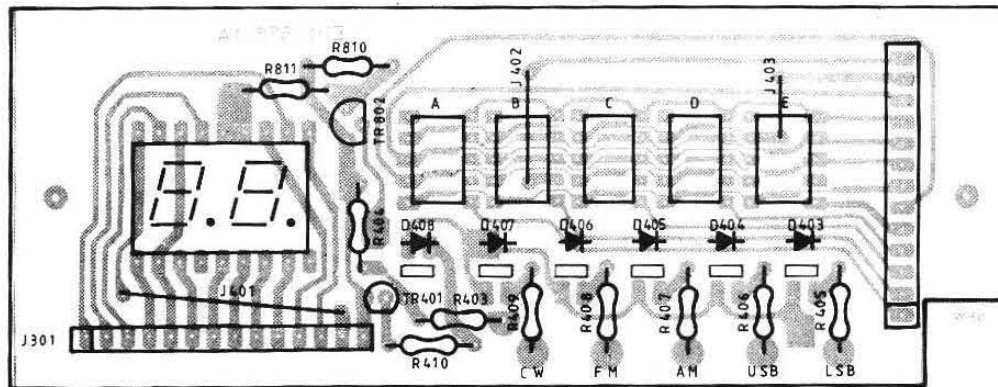
EPTOSSB40Z Channel Readout



EPTOSSB50Z ECHO



EPT210010A FREQUENCY COUNTER



EPTOSSB41A FREQUENCY COUNTER DISPLAY

