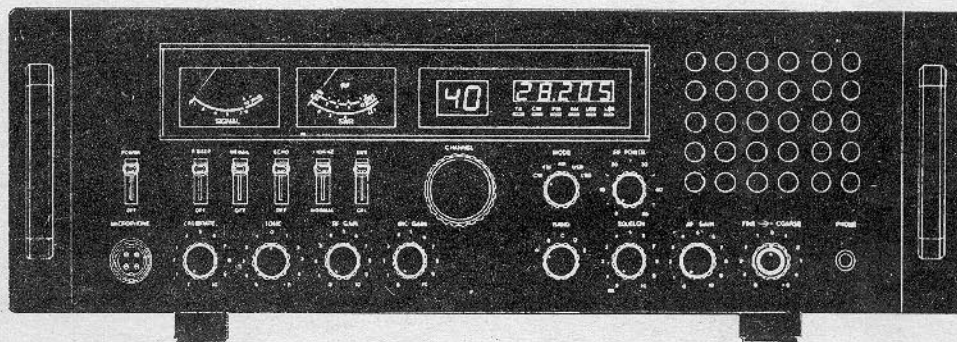


**Price \$24.95**

# GALAXY SATURN

## Service/Owners Manual



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

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## GALAXY SATURN SPECIFICATION INFORMATION

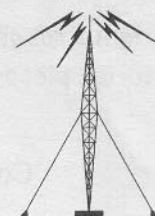
| GENERAL SPECIFICATIONS      |  | RECEIVER SPECIFICATIONS    |  |
|-----------------------------|--|----------------------------|--|
| Channels                    | Over 3000 Channels                               | Am Sensitivity             | 1 $\mu$ V for 10dB S/N   |
| Modulation Modes            | CW,FM,AM,USB,LSB                                 | FM Sensitivity             | 1 $\mu$ V for 20dB S/N   |
| Frequency Range             | 5-Band 26.065 - 28.305<br>6-Band 25.615 - 28.305 | SSB Sensitivity            | 0.2 $\mu$ V for 10dB S/N   |
| Frequency Control           | Phase-Locked Synthesizer                         | AM/FM Selectivity          | 5 dB at 4 KHz, 50dB at 10KHz                                       |
| Frequency Tolerance         | $\pm$ 0.005%                                     | SSB Selectivity            | 5 dB at 2 KHz  |
| Frequency Stability         | $\pm$ 0.003%                                     | Image Rejection            | More than 50 dB  |
| Operating Temperature Range | -30° C to +50° C                                 | IF Rejection               | More than 80 dB at 455KHz  |
| Microphone                  | Plug-In - 4Pin, 600Ohm<br>Dynamic Type           | AGC Capabilities           | Change in audio output less<br>than 12 dB: from 10 $\mu$ V to 0.4V |
| AC Input Voltage            | 110V 60Hz (220V 50Hz)                            | Squelch                    | Adjustable - threshold less than<br>0.7 $\mu$ V                    |
| AC Power Consumption        | 90 Watts Average                                 | Audio Frequency Response   | 400 to 2,500 Hz  |
| Antenna Connector           | Standard SO-239                                  | Audio Distortion           | Less than 10% at 2 Watts output<br>into 8 Ohms                     |
| Semiconductors              | 9 IC, 1 FET, 61 Transistors                      | Adjacent Channel Rejection | Greater than 75 dB   |
| Meter #1                    | Shows relative RF power<br>output/Antenna SWR    | Cross Channel Modulation   | Greater than 50 dB   |
| Meter #2                    | Shows Received Signal<br>Strength in "S" Units   | Intermediate Frequency     | 10.695 MHz [AM-1st,SSB]<br>455 KHz [AM-2nd]                        |

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

|                       |   |
|-----------------------|---|
| Clarifier Range       | $\pm$ 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<br>optional Ext. speaker is used |

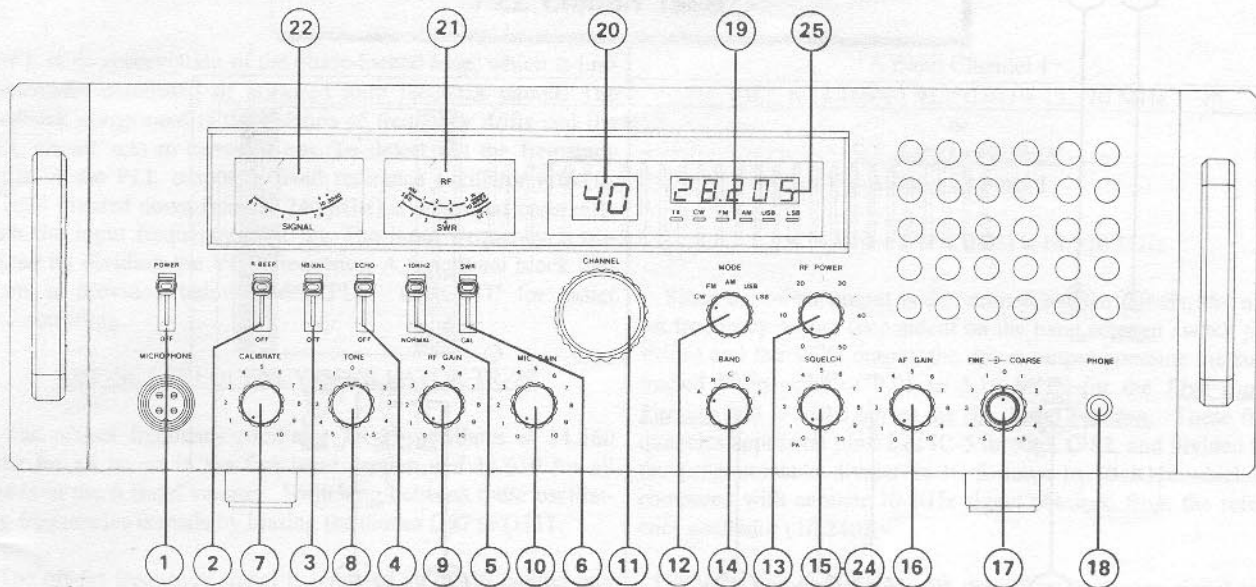
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# Radio Operation Guide Section

## 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 Blanking-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 bass 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)

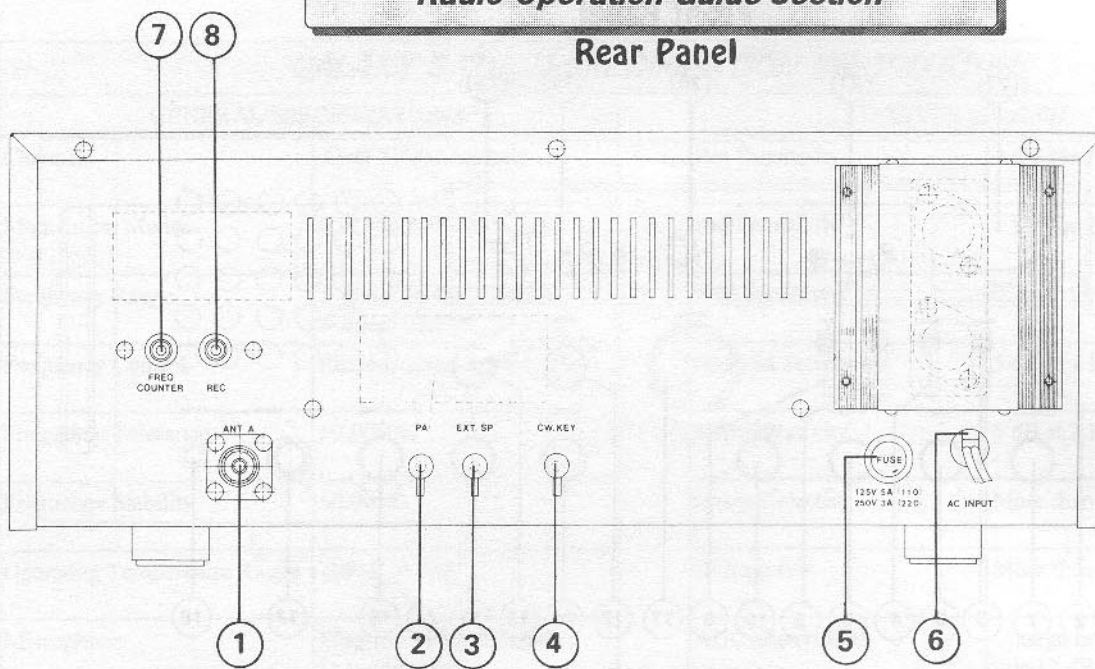
Activates Public address mode when switch is pulled. Be sure to use this function only when an external speaker is connected to the PA/SP jack.

#### 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.



**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 of 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.

$$f_{vco} = f_{off-set} + N_{fr}$$

Where,  $f_{vco}$  = VCO frequency, N = programming code for the divider output, fr = 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.

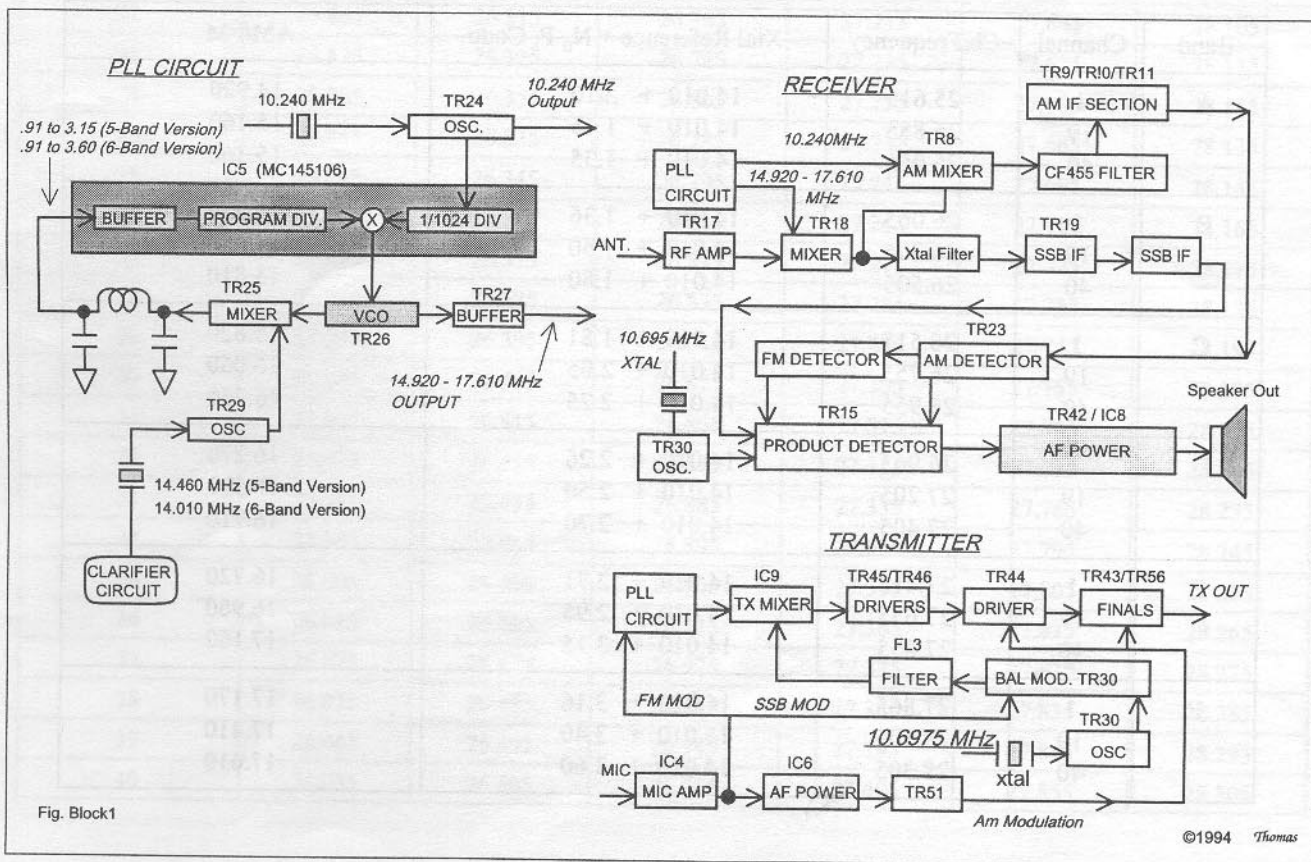


Fig. Block1

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## VCO OUTPUT REFERENCE FREQUENCY CHART

### 5 Band Version using the 14.460 Oscillator Crystal

| Band | Channel | Ch.Frequency | Xtal Reference + N <sub>f</sub> 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 <sub>f</sub> 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

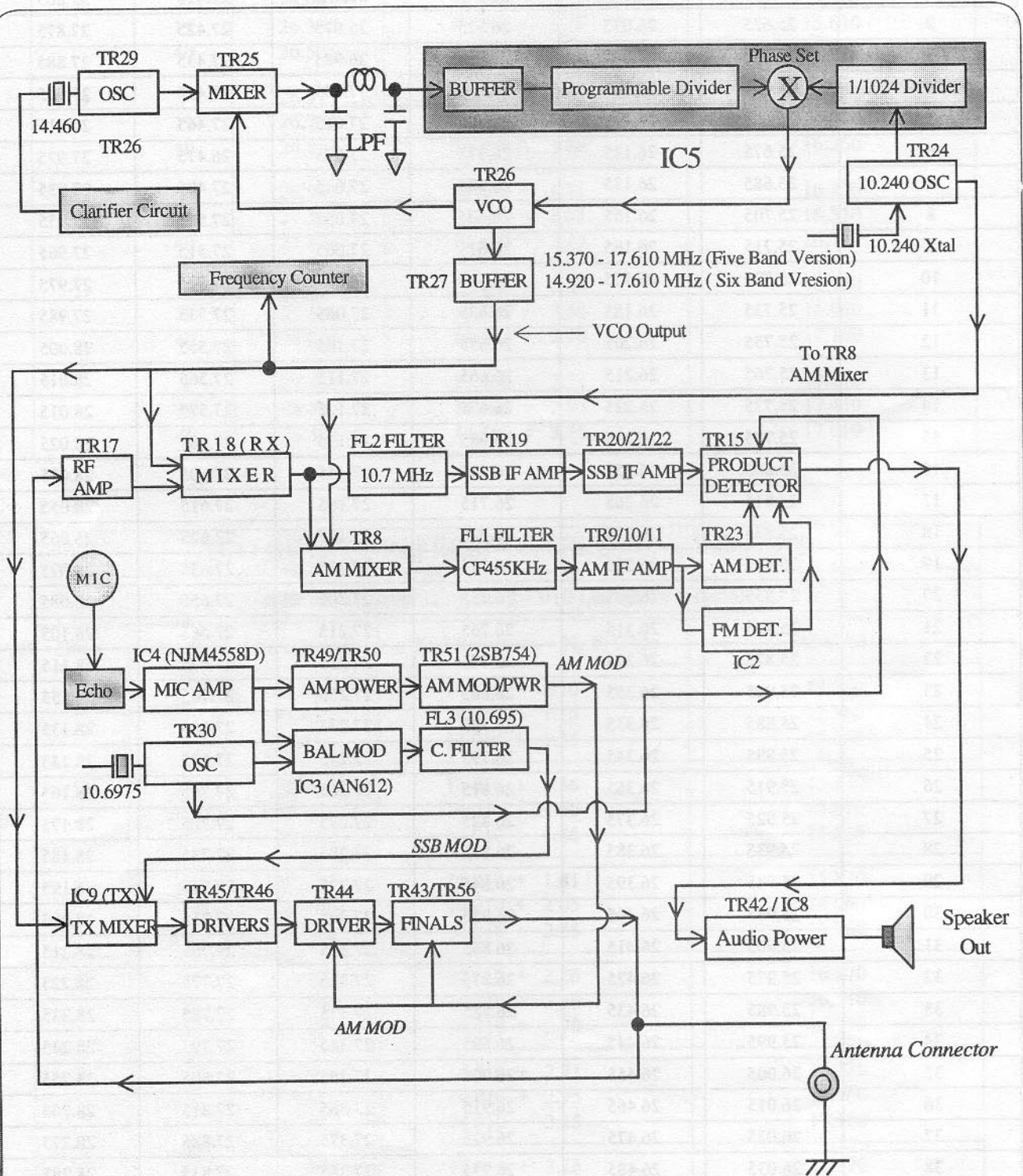


Fig. GalFlow

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## Alignment Procedure

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

### *Receiver Alignment*

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

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



## Receiver Alignment

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

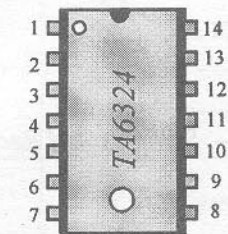
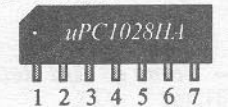


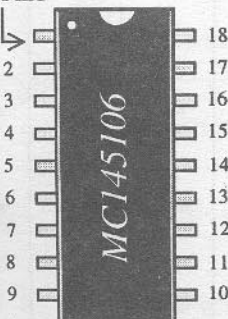
| TEST EQUIPMENT<br>TO USE & CONNECTION   | RADIO SETTINGS   |      |                | INSTRUCTIONS  |
|---|--|------|----------------|---|
|   | Channel  | Mode | Clarifier Pos. |   |
| Set signal generator to 27.185, 30% Modulation, Output 100 $\mu$ V                            | (5 Band Version)<br>19 C Band<br>(6 Band Version)<br>19 D Band | AM   | 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<br>Set signal generator to 27.185, No Modulation, Output 100 $\mu$ V | (5 Band Version)<br>19 C Band<br>(6 Band Version)<br>19 D Band | AM   | Center         | Connect a DC volt meter to TP1 and adjust L1 and L2 to obtain a 2.5 volt $\pm$ 0.5v reading.                                |

## Transmitter Alignment Procedure

| TEST EQUIPMENT<br>TO USE & CONNECTION  | RADIO SETTINGS   |      |                | INSTRUCTIONS   |
|--|--|------|----------------|--|
|  | Channel  | Mode | Clarifier Pos. |  |
| Connect DC mA meter to TP9 (+) and TP8 (-)   | (5 Band Version)<br>19 C Band<br>(6 Band Version)<br>19 D Band | USB  |                | Key radio with no modulation and adjust VR11 for 20 mA $\pm$ 0.5 mA.   |
| Connect DC mA meter to TP9 (+) and TP7 (-)   | (5 Band Version)<br>19 C Band<br>(6 Band Version)<br>19 D Band | USB  |                | First adjust VR10 and VR20 to their minimum position ( fully counter clockwise ). Key radio with no modulation and adjust VR10 to 50 mA $\pm$ 5mA and then adjust VR20 to 100mA $\pm$ 5mA                  |
| RF Wattmeter to Antenna Connector, Key radio and Inject a 1000Hz 30mV to mike audio input (Pin 2)  | (5 Band Version)<br>40 E Band<br>(6 Band Version)<br>40 F Band | 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)<br>40 E Band<br>(6 Band Version)<br>40 F Band | 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)<br>19 C Band<br>(6 Band Version)<br>19 D Band | 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)<br>19 C Band<br>(6 Band Version)<br>19 D Band | 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)<br>19 C Band<br>(6 Band Version)<br>19 D Band | 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)<br>19 C Band<br>(6 Band Version)<br>19 D Band | 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 $\pm$ 10mV 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 |  |  |  |
|---|---|---|-----------------------------------|--------------------------------|-------|----------------------------|-------|------------|--------|--|--|--|
| <b>IC1</b><br><b>TA6324</b><br>or<br><b>BA10324</b><br><br>Squelch/<br>AGC Amp<br><br><i>Substitute</i><br>(None Found) |    | 1   |                                   | 7.36V                          | 7.44V | 7.36V                      | 7.43V | 7.36V      | 7.36V  |  |  |  |
|   |   | 2   |                                   | 0.38V                          | 1.10V | 1.06V                      | 1.11V | 1.00V      | 0.98V  |  |  |  |
|   |   | 3   |                                   | 0.51V                          | 0.66V | 0.50V                      | 0.65V | 0.50V      | 0.50V  |  |  |  |
|   |   | 4   |                                   | 8.62V                          | 8.59V | 8.62V                      | 8.59V | 8.62V      | 8.62V  |  |  |  |
|   |   | 5   |                                   | 0V                             | 0V    | 0V                         | 0V    | 0V         | 0V     |  |  |  |
|   |   | 6   |                                   | 0.06V                          | 0.12V | 0.08V                      | 0.20V | 0.09V      | 0.02V  |  |  |  |
|   |   | 7   |                                   | 0.17V                          | 0V    | 0.20V                      | 0V    | 0.23V      | 0.03V  |  |  |  |
|   |   | 8   |                                   | 0V                             | 0.80V | 0V                         | 0.80V | 0V         | 0.80V  |  |  |  |
|   |   | 9   |                                   | 2.32V                          | 2.30V | 2.32V                      | 2.30V | 2.32V      | 2.34V  |  |  |  |
|   |   | 10  |                                   | 0V                             | 0V    | 0V                         | 0V    | 0V         | 0V     |  |  |  |
|   |   | 11  |                                   | 0V                             | 0V    | 0V                         | 0V    | 0V         | 0V     |  |  |  |
|   |   | 12  |                                   | 0.31V                          | 0.29V | 0.29V                      | 0.27V | 0.30V      | 0.27V  |  |  |  |
|   |   | 13  |                                   | 0.31V                          | 0.51V | 0.50V                      | 0.50V | 0.30V      | 0.27V  |  |  |  |
|   |   | 14  |                                   | 0V                             | 0V    | 0V                         | 0V    | 0V         | 0V     |  |  |  |
|   |   | *Some units use a B10324 IC as a direct substitute. |                                   |                                |       | (No Pin Information Found) |       |            |        |  |  |  |
| IC1 Voltages Taken in Receive Mode<br>W/ Radio Squelched  |   |   |                                   | 1 = 7.4V                       |       |                            |       | 8 = 7.21V  |        |  |  |  |
|   |   |   |                                   | 2 = 0.55V                      |       |                            |       | 9 = 2.36V  |        |  |  |  |
|   |   |   |                                   | 3 = 0.5V                       |       |                            |       | 10 = 0V    |        |  |  |  |
|   |   |   |                                   | 4 = 8.63V                      |       |                            |       | 11 = 0V    |        |  |  |  |
|   |   |   |                                   | 5 = 0.04V                      |       |                            |       | 12 = 0.31V |        |  |  |  |
|   |   |   |                                   | 6 = 0.04V                      |       |                            |       | 13 = 0V    |        |  |  |  |
|   |   |   |                                   | 7 = 0.12V                      |       |                            |       | 14 = 0.70V |        |  |  |  |
| Voltages are the same for<br>AM/FM/USB/LSB  |   |   |                                   |                                |       |                            |       |            |        |  |  |  |
| <b>IC2</b><br><b>uPC1028HA</b><br><br>FM IF Amp<br><br><i>Substitute</i><br>NTE-1234                                    |    | 1   | Q1 Collector                      | 0V                             | 0V    | 1.28V                      | 1.26V | 0V         | 0V     |  |  |  |
|   |   | 2   | Q1 Base                           | 0V                             | 0V    | 1.31V                      | 1.24V | 0V         | 0V     |  |  |  |
|   |   | 3   | Q1 Emitter                        | 0V                             | 0V    | 7.41V                      | 7.43V | 0V         | 0V     |  |  |  |
|   |   | 4   | D2 Cathode                        | 0V                             | 0V    | 0V                         | 0V    | 0V         | 0V     |  |  |  |
|   |   | 5   | D1 Anode                          | 0V                             | 0V    | 3.23V                      | 3.36V | 0V         | 0V     |  |  |  |
|   |   | 6   | Q2 Emitter                        | 0V                             | 0V    | 3.22V                      | 3.36V | 0V         | 0V     |  |  |  |
|   |   | 7   | Q2 Collector                      | 0V                             | 0V    | 4.86V                      | 3.94V | 0V         | 0V     |  |  |  |
| FM IF Amp<br>7 Lead SIP   |   |   |                                   |                                |       |                            |       |            |        |  |  |  |
| <b>IC3</b><br><b>AN612</b><br><br>Balanced Modulator<br><br><i>Substitute</i><br>NTE-1249                               |   | 1   | Balance Control/Audio In          | 3.10V                          | 3.06V | 0V                         | 0V    | 3.10V      | 3.06V  |  |  |  |
|   |   | 2   | Modulation Control                | 3.47V                          | 3.40V | 3.47V                      | 3.40V | 3.48V      | 3.43V  |  |  |  |
|   |   | 3   | Carrier In                        | 3.46V                          | 3.39V | 3.45V                      | 3.39V | 3.47V      | 3.42V  |  |  |  |
|   |   | 4   | Ground                            | 0V                             | 0V    | 0V                         | 0V    | 0V         | 0V     |  |  |  |
|   |   | 5   | DC Source Bal. Mod. Ctl           | 6.27V                          | 6.19V | 6.25V                      | 6.13V | 6.25V      | 6.13V  |  |  |  |
|   |   | 6   | Vcc (DC Supply Voltage)           | 7.83V                          | 7.65V | 7.83V                      | 7.65V | 7.90V      | 7.73V  |  |  |  |
|   |   | 7   | Modulated Carrier Output          | 7.97V                          | 4.10V | 7.97V                      | 4.10V | 7.97V      | 4.23V  |  |  |  |
| Balanced Modulator<br>7 Lead SIP  |   |   |                                   |                                |       |                            |       |            |        |  |  |  |
| <b>IC4</b><br><b>MJM4558D</b><br>or<br><b>BA4558</b><br>Mike Amp<br><br><i>Substitute</i><br>NTE-778A                   |  | 1   | Output 1                          | 4.57V                          | 4.54V | 4.57V                      | 4.54V | 4.57V      | 4.54V  |  |  |  |
|   |   | 2   | Input 1 (-)                       | 4.58V                          | 4.54V | 4.58V                      | 4.54V | 4.58V      | 4.54V  |  |  |  |
|   |   | 3   | Input 1 (+)                       | 4.58V                          | 4.55V | 4.58V                      | 4.55V | 4.58V      | 4.55V  |  |  |  |
|   |   | 4   | V (-)                             | 0V                             | 0V    | 0V                         | 0V    | 0V         | 0V     |  |  |  |
|   |   | 5   | Input 2 (+)                       | 4.51V                          | 2.25V | 4.51V                      | 2.25V | 4.51V      | 2.25V  |  |  |  |
|   |   | 6   | Input 2 (-)                       | 3.33V                          | 3.31V | 3.33V                      | 3.31V | 3.33V      | 3.31V  |  |  |  |
|   |   | 7   | Output 2                          | 7.74V                          | 2.46V | 7.74V                      | 2.46V | 7.74V      | 2.46V  |  |  |  |
|   |   | 8   | V (+)                             | 8.43V                          | 8.38V | 8.43V                      | 8.38V | 8.43V      | 8.38V  |  |  |  |
| Dual Omp Amp  |   |   |                                   |                                |       |                            |       |            |        |  |  |  |
| <b>IC5</b><br><b>MC145106P</b><br>(Motorola)<br><br>PLL CHIP<br><br><i>Substitute</i><br>MM55106<br>(National)          |  | 1   | Vdd (Supply Voltage)              | 7.52V                          |       |                            |       |            |        |  |  |  |
|   |   | 2   | F <sub>IN</sub> (VCO Input)       | 3.58V                          |       |                            |       |            |        |  |  |  |
|   |   | 3   | RI (10.240 Reference Osc. Input)  | 3.8V                           |       |                            |       |            |        |  |  |  |
|   |   | 4   | RO (10.240 Reference Osc. Output) | 3.82V                          |       |                            |       |            |        |  |  |  |
|   |   | 5   | 1/2R (10.240 divide by 2)         | 3.54V                          |       |                            |       |            |        |  |  |  |
|   |   | 6   | FS (1=10KHz Steps, 0=5 KHz Steps) | 7.44V                          |       |                            |       |            |        |  |  |  |
|   |   | 7   | PD (Phase Detector)               | 4.71V                          |       |                            |       |            |        |  |  |  |
|   |   | 8   | LD (1=Locked, 0=Unlocked)         | 7.0V                           |       |                            |       |            |        |  |  |  |
|   |   | 9   | P8 (Programmable Input)           | 0V                             |       |                            |       |            |        |  |  |  |
|   |   | 10  | P7 (Programmable Input)           | 8.3V                           |       |                            |       |            |        |  |  |  |
|   |   | 11  | P6 (Programmable Input)           | 8.3V                           |       |                            |       |            |        |  |  |  |
|   |   | 12  | P5 (Programmable Input)           | 8.3V                           |       |                            |       |            |        |  |  |  |
|   |   | 13  | P4 (Programmable Input)           | 0V                             |       |                            |       |            |        |  |  |  |
|   |   | 14  | P3 (Programmable Input)           | 0V                             |       |                            |       |            |        |  |  |  |
|   |   | 15  | P2 (Programmable Input)           | 0V                             |       |                            |       |            |        |  |  |  |
|   |   | 16  | P1 (Programmable Input)           | 0V                             |       |                            |       |            |        |  |  |  |
|   |   | 17  | P0 (Programmable Input)           | 8.3V                           |       |                            |       |            |        |  |  |  |
|   |   | 18  | VSS (Ground)                      | 0V                             |       |                            |       |            |        |  |  |  |
| Phase-Locked Loop Chip<br>9 Bit Binary w/Internal Pull Down<br>Resistors on P0 thru P8.                                 |   |   |                                   | ----- 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<br>MC14008B<br>or<br>MC14008BCB<br>or<br>TC4008BP<br><br>PLL Adder<br>Chip<br><br><i>Substitute</i><br>NTE-4008B                               | <p>4-Bit Full Adder Chip<br/>w/Parallel Carry Out.<br/>16 Pin DIP</p> | 1 A4<br>2 B3<br>3 A3<br>4 B2<br>5 A2<br>6 B1<br>7 A1<br>8 Vss (Ground)<br>9 C1<br>10 S1<br>11 S2<br>12 S3<br>13 S4<br>14 Co<br>15 B4<br>16 Vdd (DC Supply Voltage)   | 0V<br>0V<br>8.6V<br>8.0V<br>8.6V<br>0V<br>8.6V<br>0V<br>0V<br>8.3V<br>0V<br>0V<br>0V<br>8.6V<br>8.1V<br>8.6V | ----- Same as AM Receive -----   |                             |                              |                             |                              |        |
| IC7<br>MC14008B<br>or<br>MC148BCB<br>or 00<br>TC4008BP<br><br>PLL Adder<br>Chip<br><br><i>Substitute</i><br>NTE-4008B                              | <p>4-Bit Full Adder Chip<br/>w/Parallel Carry Out.<br/>16 Pin DIP</p> | 1 A4<br>2 B3<br>3 A3<br>4 B2<br>5 A2<br>6 B1<br>7 A1<br>8 Vss (Ground)<br>9 C1<br>10 S1<br>11 S2<br>12 S3<br>13 S4<br>14 Co<br>15 B4<br>16 Vdd (DC Supply Voltage)   | 8.6V<br>8.6V<br>0V<br>0V<br>0V<br>8.1V<br>0V<br>0V<br>8.6V<br>0V<br>8.3V<br>8.3V<br>8.3V<br>0V<br>0V<br>8.6V | ----- Same as AM Receive -----   |                             |                              |                             |                              |        |
| IC8<br>TA7222P<br><br>AUDIO IC<br><br><i>Substitute</i><br>NTE-1278  | <p>5.8 Watt Audio Power Amp</p>                                       | 1 Vcc (DC Supply Voltage)<br>2 Ripple Filter<br>3 Muting Control<br>4 Input<br>5 Feedback<br>6 Ground<br>7 Ground<br>8 Ground<br>9 Output<br>10 Bootstrap  | 13.9V<br>6.7V<br>0V<br>0V<br>1.13V<br>1.13V<br>0V<br>0V<br>0V<br>7V<br>13.4V                                 | 13.9V<br>6.7V<br>0V<br>0.56V<br>2.23V<br>2.23V<br>0V<br>0V<br>0V<br>0V<br>11.7V                        | SAME<br>AS<br>AM<br>RECEIVE | SAME<br>AS<br>AM<br>TRANSMIT | SAME<br>AS<br>AM<br>RECEIVE | SAME<br>AS<br>AM<br>TRANSMIT |        |
| IC9<br>SO42P<br><br>TRANSMIT<br>MIXER IC<br><br><i>Substitute</i><br>N/A<br><br>Uniden Part No.<br>2000-034<br><br>Cobra Part No.<br>307-143-9-004 |   | 1 Ground<br>2 Output <sup>1</sup><br>3 Output <sup>1</sup><br>4 Ground<br>5 Output <sup>1</sup> Tap<br>6 Ground<br>7 Input <sup>1</sup><br>8 Input <sup>1</sup><br>9 Ground<br>10 Bootstrap<br>11 Input <sup>2</sup><br>12 Bootstrap<br>13 Input <sup>2</sup><br>14 Ground | 0V<br>0V<br>0V<br>0V<br>0V<br>0V<br>0V<br>0V<br>0V<br>0V<br>0V<br>0V<br>0V                                   | 0V<br>8.1V<br>8.1V<br>0V<br>8.0V<br>0V<br>2.9V<br>2.9V<br>0V<br>1.16V<br>1.44V<br>1.16V<br>1.44V<br>0V | SAME<br>AS<br>AM<br>RECEIVE | SAME<br>AS<br>AM<br>TRANSMIT | SAME<br>AS<br>AM<br>RECEIVE | SAME<br>AS<br>AM<br>TRANSMIT |        |



## TRANSISTOR PINOUT & VOLTAGE CHART

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



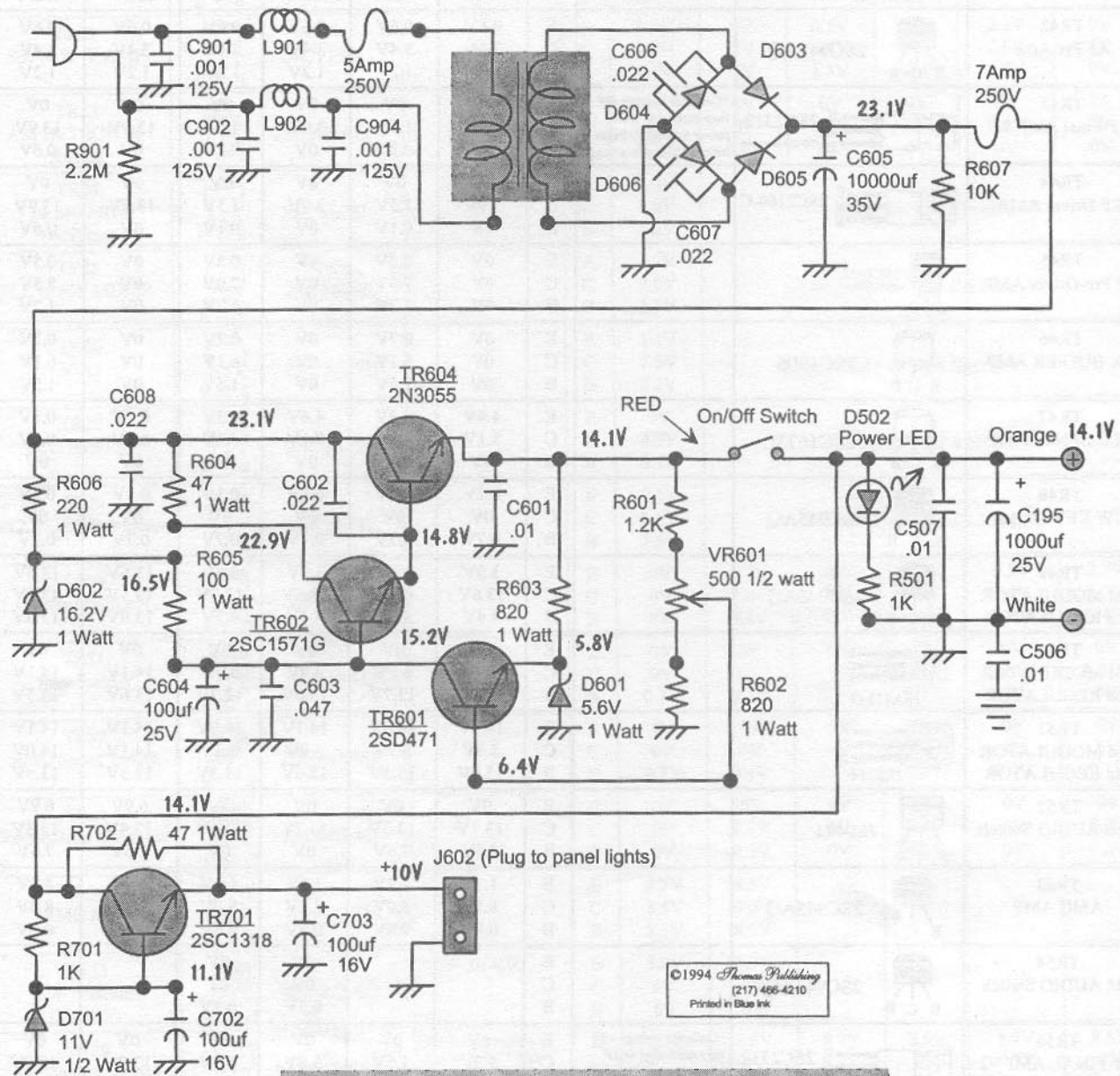
| TRANSISTOR PINOUT & VOLTAGE CHART |  |  |             |                      |                            |                      |                      |                      |                      |
|-----------------------------------|--|--|-------------|----------------------|----------------------------|----------------------|----------------------|-------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

## TRANSISTOR PINOUT & VOLTAGE CHART

| DEVICE                             | PINOUT  | REMARKS   | PIN         | AM RX                  | AM TX                  | FM RX                  | FM TX                  | SSB RX                  | SSB TX                  |
|------------------------------------|---|---|-------------|------------------------|------------------------|------------------------|------------------------|-------------------------|-------------------------|
| TR40<br>Voltage Regulator          |  2SC945AQ<br>E C B                          |   | E<br>C<br>B | 1.0V<br>13.3V<br>1.6V  | 1.0V<br>13.2V<br>1.6V  | 1.0V<br>13.3V<br>1.6V  | 1.0V<br>13.2V<br>1.6V  | 1.0V<br>13.3V<br>1.6V   | 1.0V<br>13.2V<br>1.6V   |
| TR41<br>Voltage Regulator          |  2SA473-O<br>E C B                         |   | E<br>C<br>B | 14.0V<br>8.7V<br>13.3V | 13.9V<br>8.7V<br>13.2V | 14.0V<br>8.7V<br>13.3V | 13.9V<br>8.7V<br>13.2V | 14.0V<br>8.7V<br>13.3V  | 14.0V<br>8.7V<br>13.3V  |
| TR42<br>AF Pre Amp                 |  2SC945AQ<br>E C B                         |   | E<br>C<br>B | 0.6V<br>3.4V<br>1.2V   | 0.6V<br>3.4V<br>1.2V   | 0.6V<br>3.4V<br>1.2V   | 0.6V<br>3.4V<br>1.2V   | 0.6V<br>3.4V<br>1.2V    | 0.6V<br>3.4V<br>1.2V    |
| TR43<br>RF Final AMP #1            |  2SC2312<br>(TO-220 case style)<br>E C B   | *Collector voltage will vary according to RF power Setting. Voltages taken at lo power setting. | E<br>C<br>B | 0V<br>3.9V<br>0V       | 0V<br>1.5V<br>0.2V     | 0V<br>3.9V<br>0V       | 0V<br>1.5V<br>0.2V     | 0V<br>13.9V<br>0V       | 0V<br>13.9V<br>0.6V     |
| TR44<br>RF Driver AMP              |  2SC2166-C<br>E C B                        |   | E<br>C<br>B | 0V<br>3.9V<br>0V       | 0V<br>1.5V<br>0.1V     | 0V<br>3.9V<br>0V       | 0V<br>1.5V<br>0.1V     | 0V<br>13.9V<br>0V       | 0V<br>13.9V<br>0.6V     |
| TR45<br>RF Pre-Driver AMP          |  2SC1973<br>(TO-18 Case)<br>E C B          |   | E<br>C<br>B | 0V<br>0V<br>0V         | 0.5V<br>7.0V<br>1.2V   | 0V<br>0V<br>0V         | 0.5V<br>7.0V<br>1.2V   | 0V<br>0V<br>0V          | 0.5V<br>8.5V<br>1.2V    |
| TR46<br>TX BUFFER AMP              |  2SC1906<br>E C B                          |   | E<br>C<br>B | 0V<br>0V<br>0V         | 0.7V<br>6.1V<br>1.5V   | 0V<br>0V<br>0V         | 0.7V<br>6.1V<br>1.5V   | 0V<br>0V<br>0V          | 0.7V<br>6.1V<br>1.5V    |
| TR47<br>ALC SENSE AMP              |  2SC1675L<br>E C B                         |   | E<br>C<br>B | 4.4V<br>8.1V<br>0V     | 4.3V<br>8.1V<br>0V     | 4.4V<br>8.1V<br>0V     | 4.3V<br>8.1V<br>0V     | 0.7V<br>8.1V<br>0V      | 0.7V<br>8.0V<br>0V      |
| TR48<br>CW KEY Switch              |  2SC945AQ<br>E C B                         |   | E<br>C<br>B | 0.1V<br>0V<br>0.7V     | 0.1V<br>0V<br>0.7V     | 0.1V<br>0V<br>0.7V     | 0.1V<br>0V<br>0.7V     | 0.1V<br>0V<br>0.7V      | 0.1V<br>0V<br>0.7V      |
| TR49<br>AM MODULATOR and REGULATOR |  2SC945AQ<br>E C B                         |   | E<br>C<br>B | 3.9V<br>13.6V<br>4.4V  | 3.8V<br>12.7V<br>4.3V  | 3.9V<br>13.6V<br>4.4V  | 3.8V<br>12.7V<br>4.3V  | 13.6V<br>13.5V<br>13.0V | 13.6V<br>13.5V<br>13.0V |
| TR50<br>AM MODULATOR and REGULATOR |  2SA473-O<br>E C B                       |   | E<br>C<br>B | 0V<br>3.9V<br>13.6V    | 0V<br>3.7V<br>12.7V    | 0V<br>3.9V<br>13.6V    | 0V<br>3.7V<br>12.7V    | 0V<br>14.1V<br>13.6V    | 0V<br>14.1V<br>13.5V    |
| TR51<br>AM MODULATOR and REGULATOR |  2SB754<br>E C B                         |   | E<br>C<br>B | 14.1V<br>3.9V<br>13.6V | 14.0V<br>3.7V<br>13.3V | 14.1V<br>3.9V<br>13.6V | 14.0V<br>3.7V<br>13.3V | 14.1V<br>14.1V<br>13.3V | 14.1V<br>14.0V<br>13.3V |
| TR52<br>SSB AUDIO Switch           |  2SD471<br>E C B                         |   | E<br>C<br>B | 0V<br>13.7V<br>7.6V    | 0V<br>13.3V<br>7.6V    | 0V<br>13.7V<br>0V      | 0V<br>13.6V<br>0V      | 6.9V<br>13.4V<br>7.6V   | 6.9V<br>13.3V<br>7.6V   |
| TR53<br>AMC AMP                    |  2SC945AQ<br>E C B                       |   | E<br>C<br>B | 1.2V<br>8.1V<br>0.8V   | 1.1V<br>8.0V<br>0.8V   | 1.2V<br>8.1V<br>0.8V   | 1.1V<br>8.0V<br>0.8V   | 4.4V<br>8.1V<br>0.8V    | 4.3V<br>8.0V<br>0.8V    |
| TR54<br>FM AUDIO Switch            |  2SC945AQ<br>E C B                       |   | E<br>C<br>B |                        |                        | 0V<br>0V<br>0.7V       | 0V<br>0V<br>0.7V       |                         |                         |
| TR56<br>RF FINAL AMP #2            |  2SC2312<br>(TO-220 case style)<br>E C B | *Collector voltage will vary according to RF power Setting. Voltages taken at lo power setting. | E<br>C<br>B | 0V<br>3.9V<br>0V       | 0V<br>1.5V<br>0.2V     | 0V<br>3.9V<br>0V       | 0V<br>1.5V<br>0.2V     | 0V<br>13.9V<br>0V       | 0V<br>13.9V<br>0.6V     |
| TR401<br>Light Driver              |  2SC945AQ<br>E C B                       |   | E<br>C<br>B | 0V<br>9.2V<br>0V       | 0V<br>0V<br>0.8V       | 0V<br>9.2V<br>0V       | 0V<br>0V<br>0.8V       | 0V<br>9.2V<br>0V        | 0V<br>0V<br>0.8         |
| TR802<br>Light Driver              |  2SD467<br>E C B                         | * CB MODE   | E<br>C<br>B | 0V<br>0V<br>0.8V       | 0V<br>0V<br>0.8V       | 0V<br>0V<br>0.8V       | 0V<br>0V<br>0.8V       | 0V<br>0V<br>0.8V        | 0V<br>0V<br>0.8V        |
|                                    |   | * PA MODE   | E<br>C<br>B | 0V<br>10.2V<br>0V      | 0V<br>10.2V<br>0V      | 0V<br>10.2V<br>0V      | 0V<br>10.2V<br>0V      | 0V<br>10.2V<br>0V       | 0V<br>10.2V<br>0V       |



# GALAXY SATURN EPTOSSB60A Power Supply



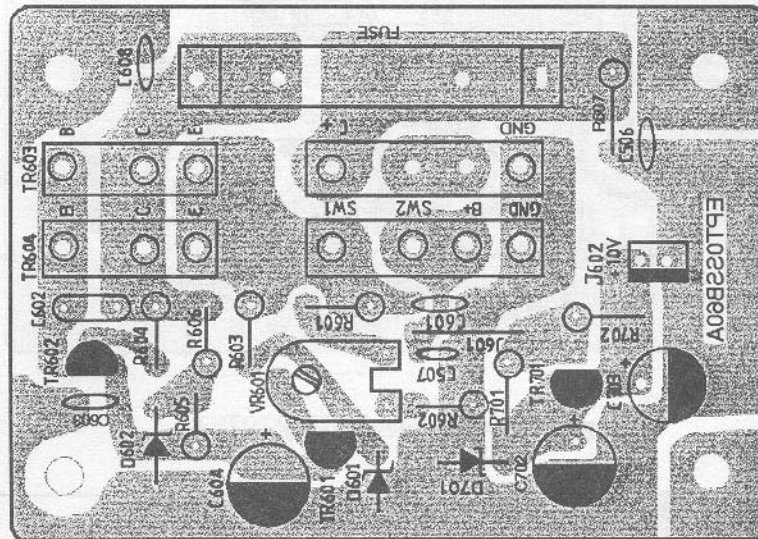
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Some units may have an additional transistor like TR604 ( 2N3055) wired in parallel for added current capabilities. This transistor is TR603. You will notice the connections on the circuit board for this regulator.

Fig Galaxy-PS

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GALAXY SATURN



EPTOSSB60A POWER SUPPLY

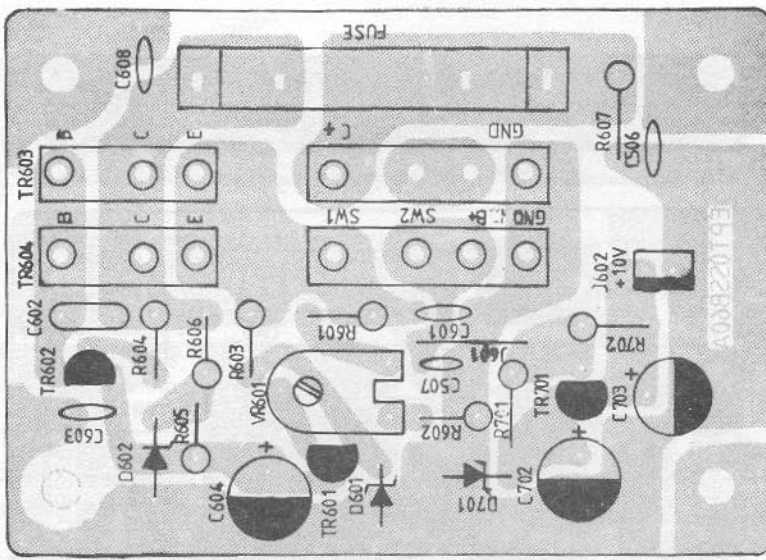
| Part Description                     | Original Number | NTE Replacement         | RCA Replacement |
|--------------------------------------|-----------------|-------------------------|-----------------|
| D601 5.6V Zener 1 Watt               | ZD5.6A          | NTE-136A                | SK5V6/136A      |
| 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 $\mu$ F 25V   |
| C506       | .01 $\mu$ F 50WV   |
| C507       | .01 $\mu$ F 50WV   |
| C601       | .01 $\mu$ F 50WV   |
| C602       | .022 $\mu$ F 100WV |
| C603       | .047 $\mu$ F 50WV  |
| C604       | 100 $\mu$ F 25V    |
| C605       | 10,000 $\mu$ F 35V |
| C606,C607  | .022 $\mu$ F 100WV |
| C608       | .022 $\mu$ F 100WV |
| C702       | 100 $\mu$ F 16V    |
| C703       | 100 $\mu$ F 16V    |

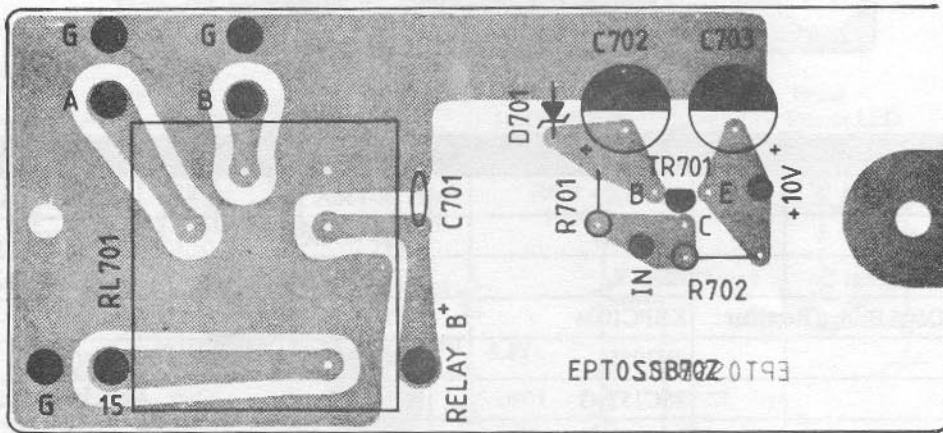
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| RESISTORS |                  |
|-----------|------------------|
| R501      | 1 K 1/2 Watt     |
| R601      | 1.2 K 1 Watt     |
| R602      | 820 Ohm 1 Watt   |
| R603      | 820 Ohm 1 Watt   |
| R604      | 47 Ohm 1 Watt    |
| R605      | 100 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  |

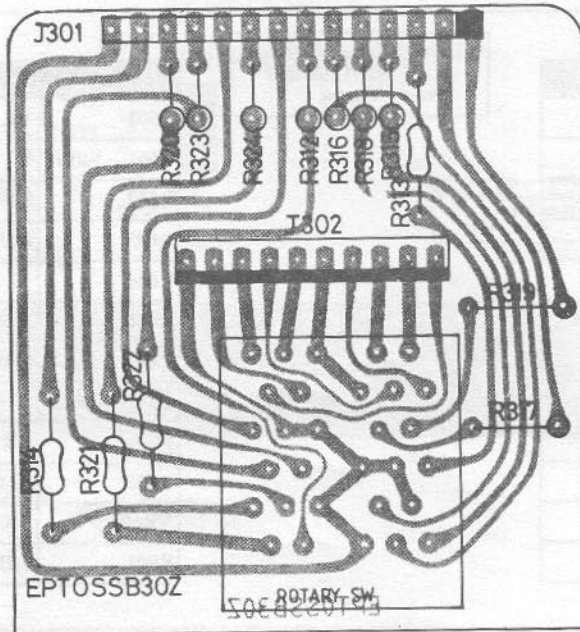




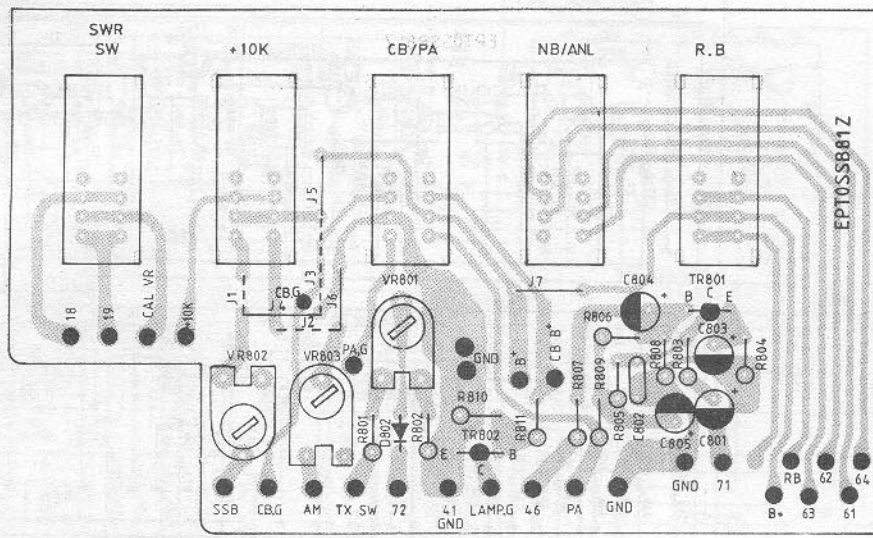
EPTOSSB60A Power Supply



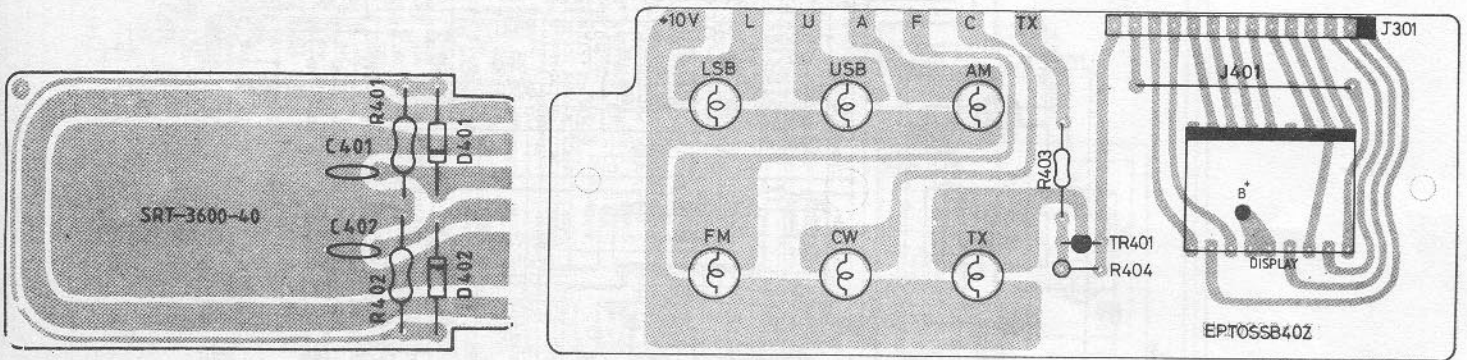
EPTOSSB70Z Antenna Selector



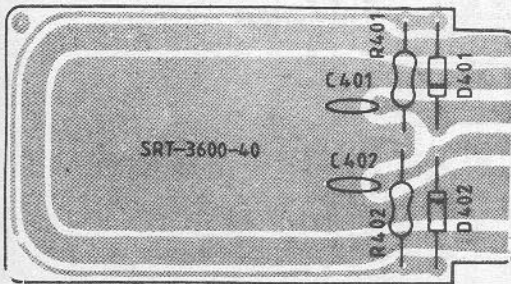
EPTOSSB30Z Channel Selector



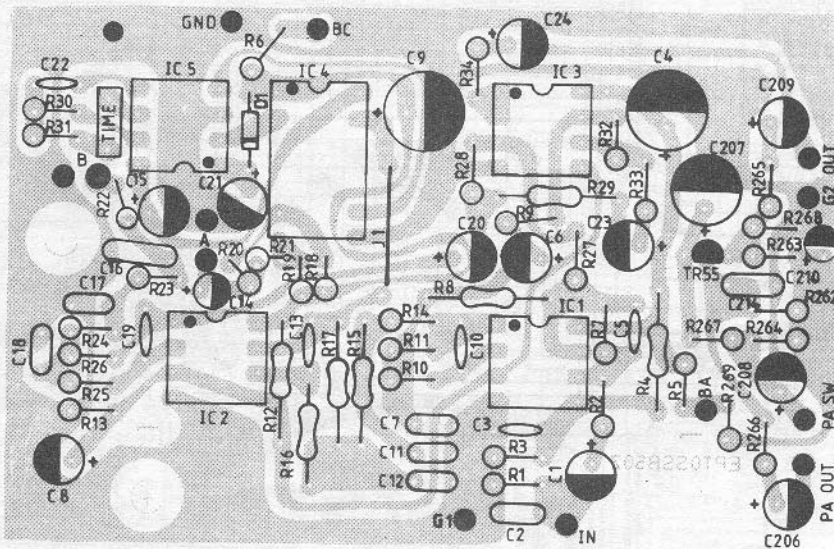
EPTOSSB81Z Function Selector



EPTOSSB40Z Channel Readout



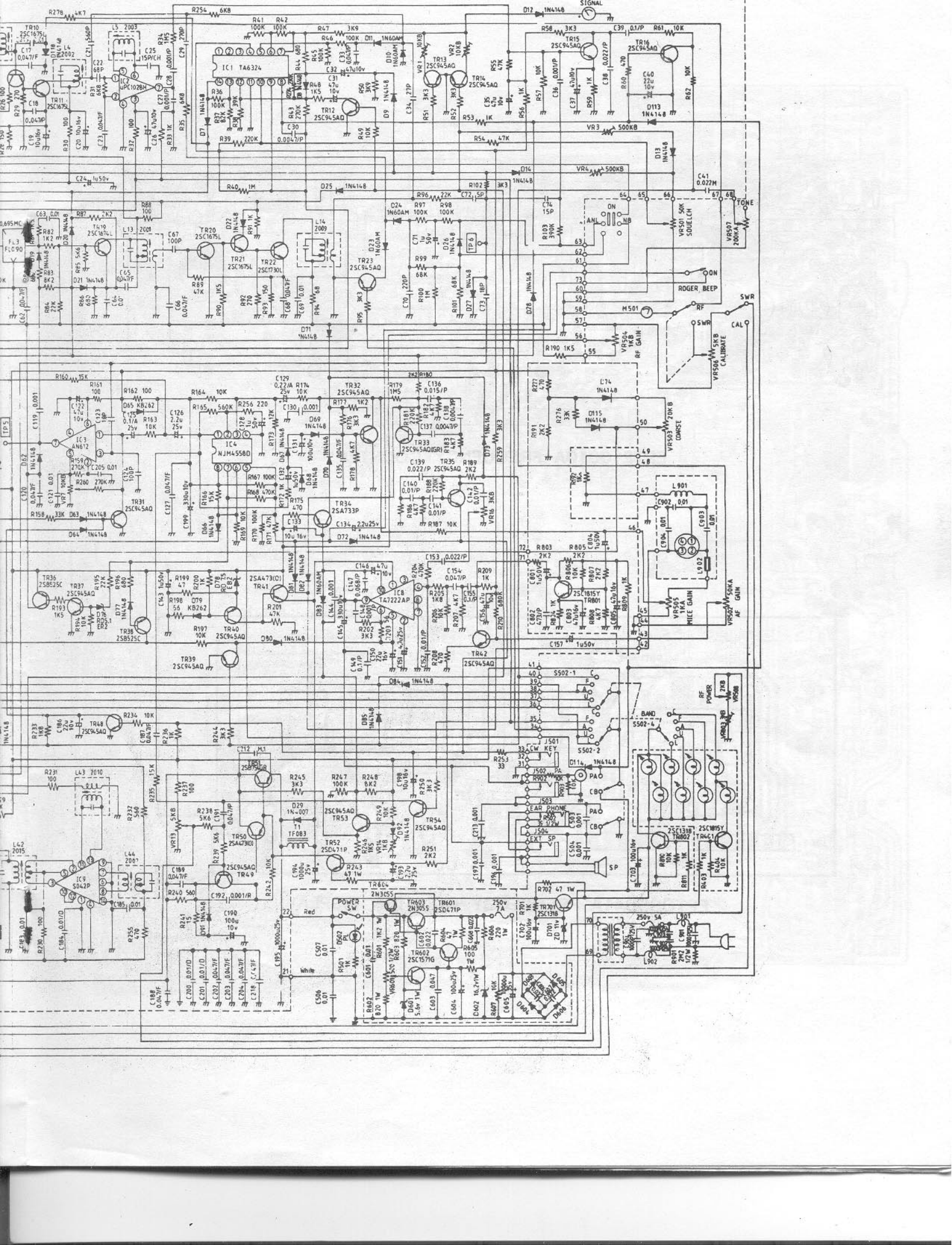
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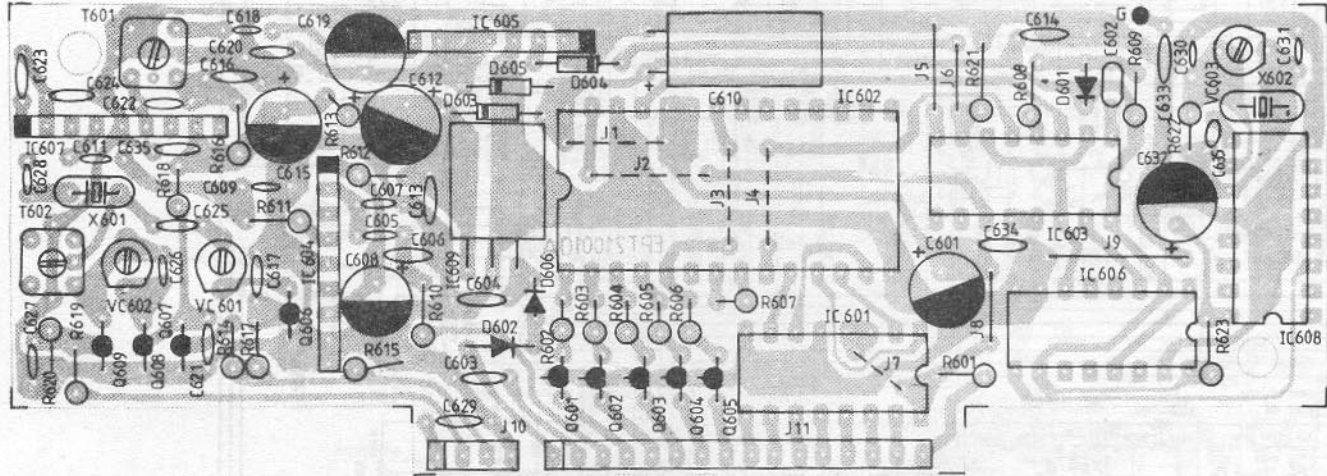
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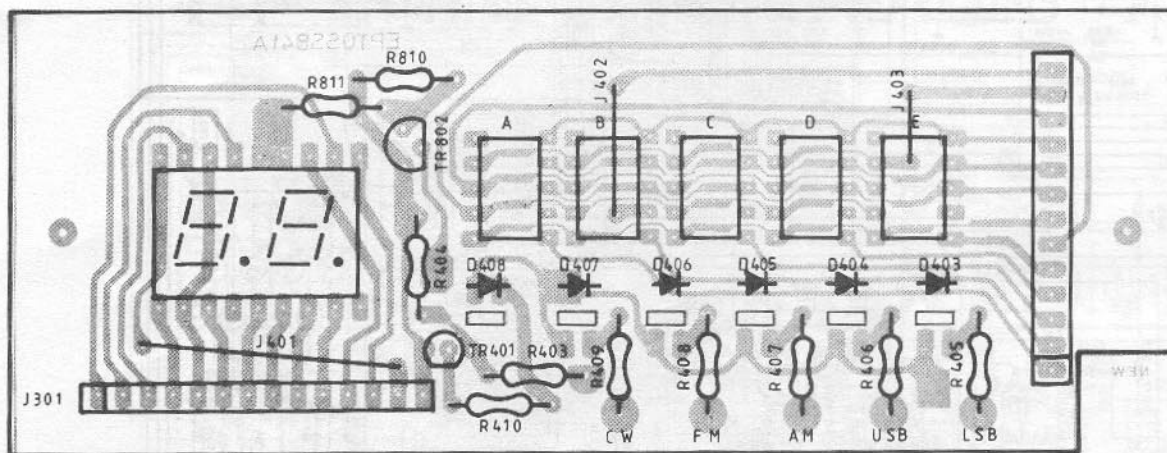




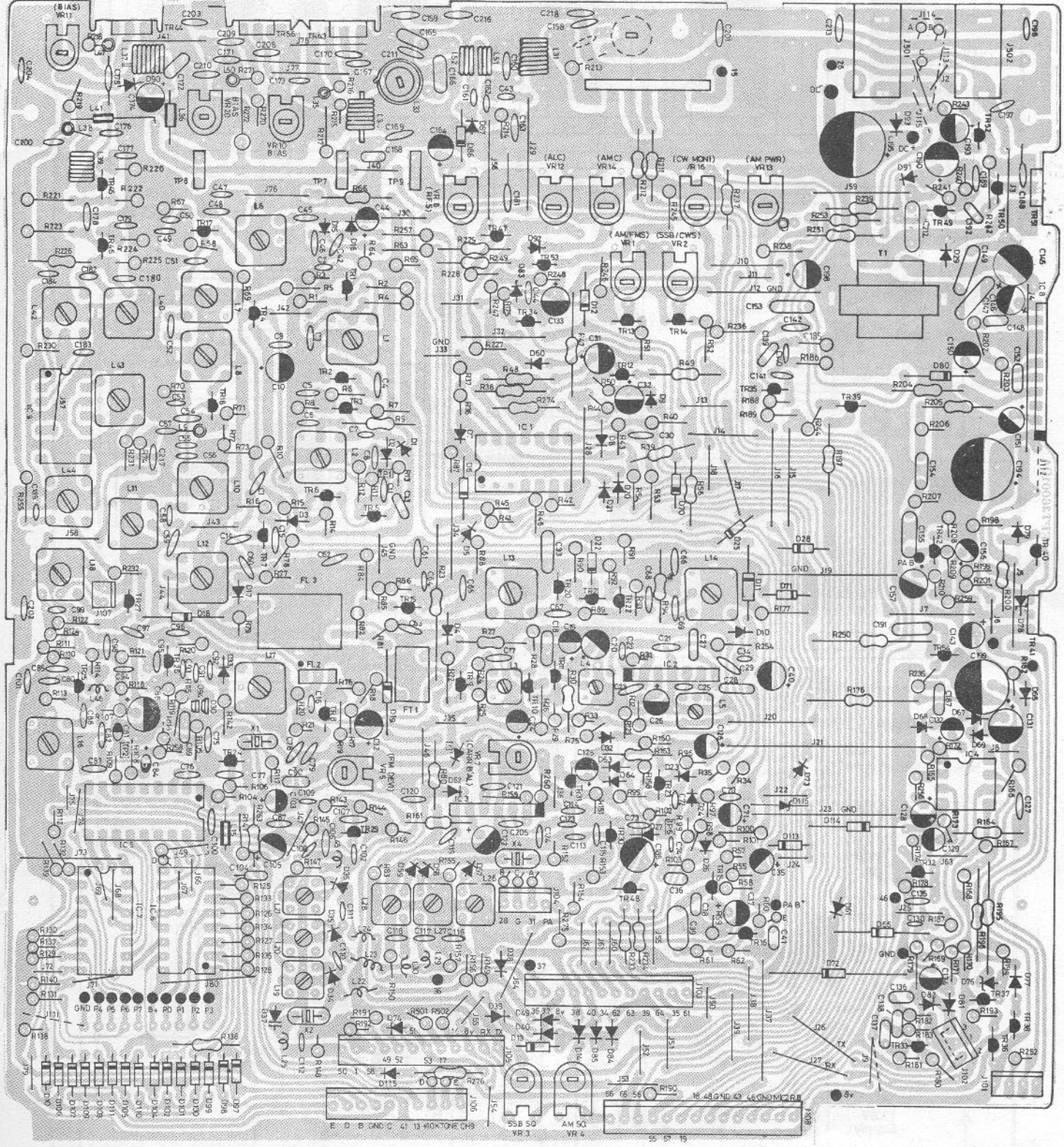




EPT210010A FREQUENCY COUNTER












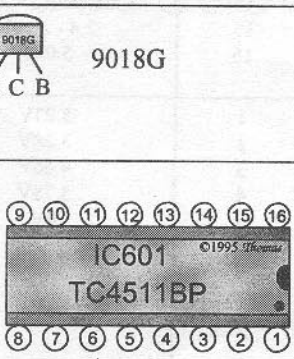
EPTOSSB41A FREQUENCY COUNTER DISPLAY





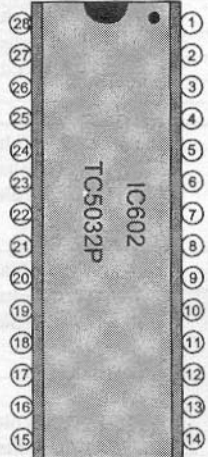

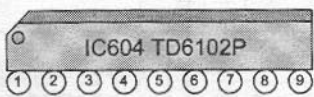
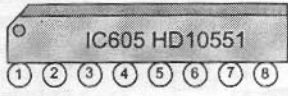


# FREQUENCY COUNTER BOARD IC & TRANSISTOR PINOUT AND VOLTAGE CHART

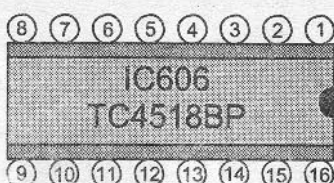
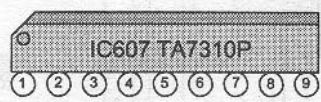
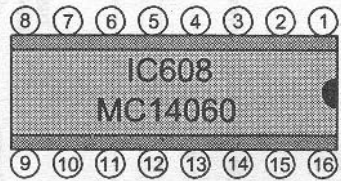
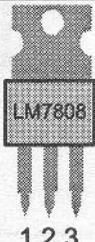
| TRANS. / IC        | Configuration   | *Pin  | CHANNEL 40 AM  | REMARKS                                 |
|--------------------|---|---|--|---|
| Q601<br>2SA733A-PB |  2SA733A-PB<br>E C B | E<br>C<br>B   | 3.1Volts<br>0 Volts<br>4.5 Volts   | *Voltages taken on<br><br>Channel 40 AM |
| Q602<br>2SA733A-PB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



# FREQUENCY COUNTER BOARD IC & TRANSISTOR PINOUT AND VOLTAGE CHART

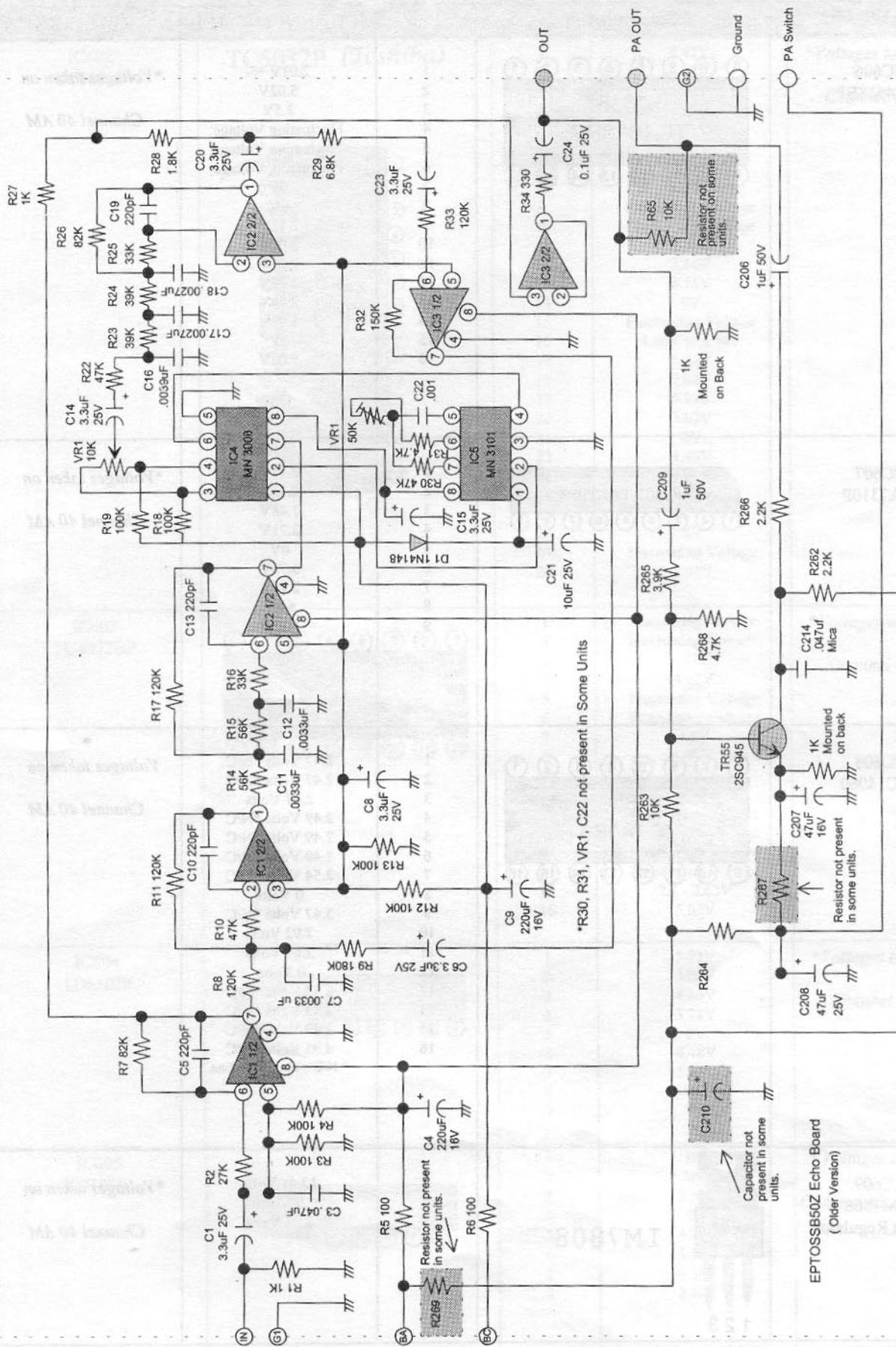
| TRANS. / IC       | Configuration  | Pin   | CHANNEL 40 AM  | REMARKS                                 |
|-------------------|--|---|--|---|
| IC602<br>TC5032P  | TC5032P (Toshiba)<br><br> | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21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

# FREQUENCY COUNTER BOARD IC & TRANSISTOR PINOUT AND VOLTAGE CHART

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



# GALAXY SATURN Echo Schematic



\*R30, R31, VR1, C22 not present in some units

Resistor not present on some units

Resistor not present in some units.

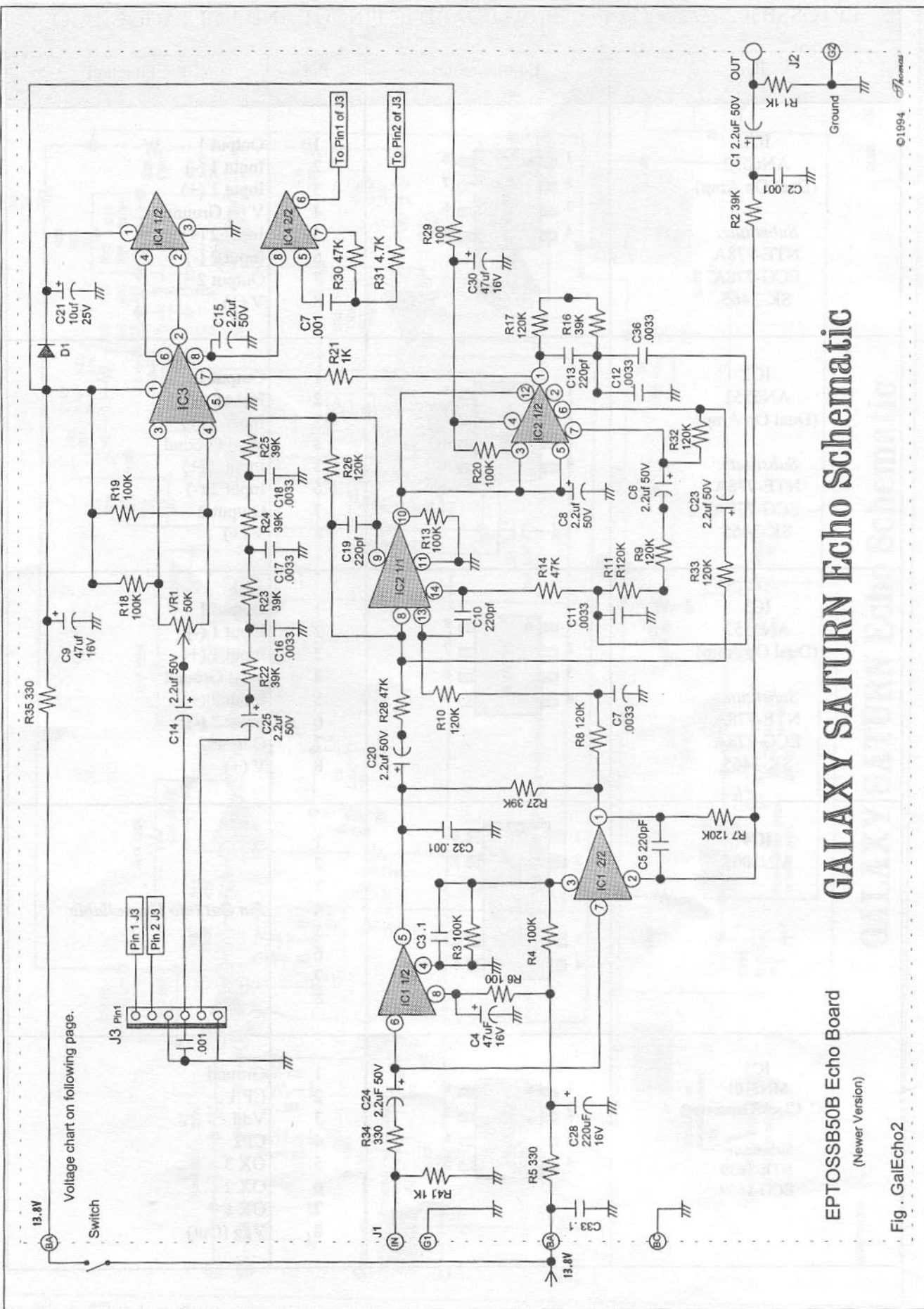
Capacitor not present in some units.

EPTOSSB50Z Echo Board (Older Version)

EPTOSSB50Z (Older Version) ECHO BOARD IC PINOUT AND VOLTAGE CHART

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



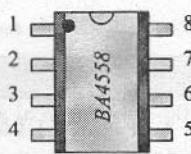
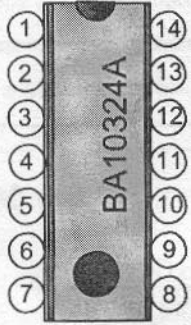
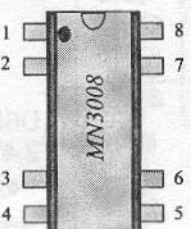
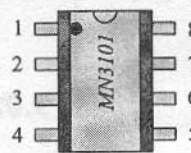


# GALAXY SATURN Echo Schematic

EPTOSSB50B Echo Board  
(Newer Version)

Fig. GalEcho2

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<br>BA4558<br>(Dual Op Amp)<br><br>Substitute:<br>NTE-778A<br>ECG-778A<br>SK-3465 | BA4558<br><br>Dual-Op Amp | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8                                    | Output 1<br>Input 1 (-)<br>Input 1 (+)<br>V (-) Ground<br>Input 2 (+)<br>Input 2 (-)<br>Output 2<br>V (+) | 6.79V<br>6.80V<br>6.76V<br>0V<br>6.77V<br>6.80V<br>6.80V<br>13.26V   | 6.73V<br>6.73V<br>6.70V<br>0V<br>6.71V<br>6.73V<br>6.73V<br>13.13V   |
| IC2<br>BA10324A  |                           | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14 | Not Available   | 6.72V<br>6.73V<br>6.69V<br>13.58V<br>6.69V<br>6.73V<br>6.72V<br>6.73V<br>6.73V<br>6.69V<br>0V<br>6.69V<br>6.73V<br>6.65V | 6.67V<br>6.67V<br>6.63V<br>13.45V<br>6.63V<br>6.67V<br>6.66V<br>6.67V<br>6.67V<br>6.63V<br>0V<br>6.63V<br>6.67V<br>6.61V |
| IC3<br>MN3008  | MN3008<br>              | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8                                    | Not Available   | 13.68V<br>6.53V<br>0V<br>6.53V<br>6.05V<br>6.83V<br>6.64V<br>0.87V   | 12.91V<br>6.46V<br>0V<br>6.46V<br>5.99V<br>6.76V<br>6.57V<br>0.86V   |
| IC4<br>MN3101<br>(IC,<br>Clock/Generator)<br><br>Substitute:<br>NTE-1639<br>ECG-1639 | MN3101<br>              | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8                                    | Ground<br>CP 1<br>Vdd<br>CP2<br>OX 3<br>OX 2<br>OX 1<br>Vgg (Out)   | 13.04V<br>6.53V<br>0V<br>6.53V<br>6.05V<br>6.83V<br>6.64V<br>0.87V   | 12.91V<br>6.46V<br>0V<br>6.46V<br>5.99V<br>6.76V<br>6.57V<br>0.86V   |

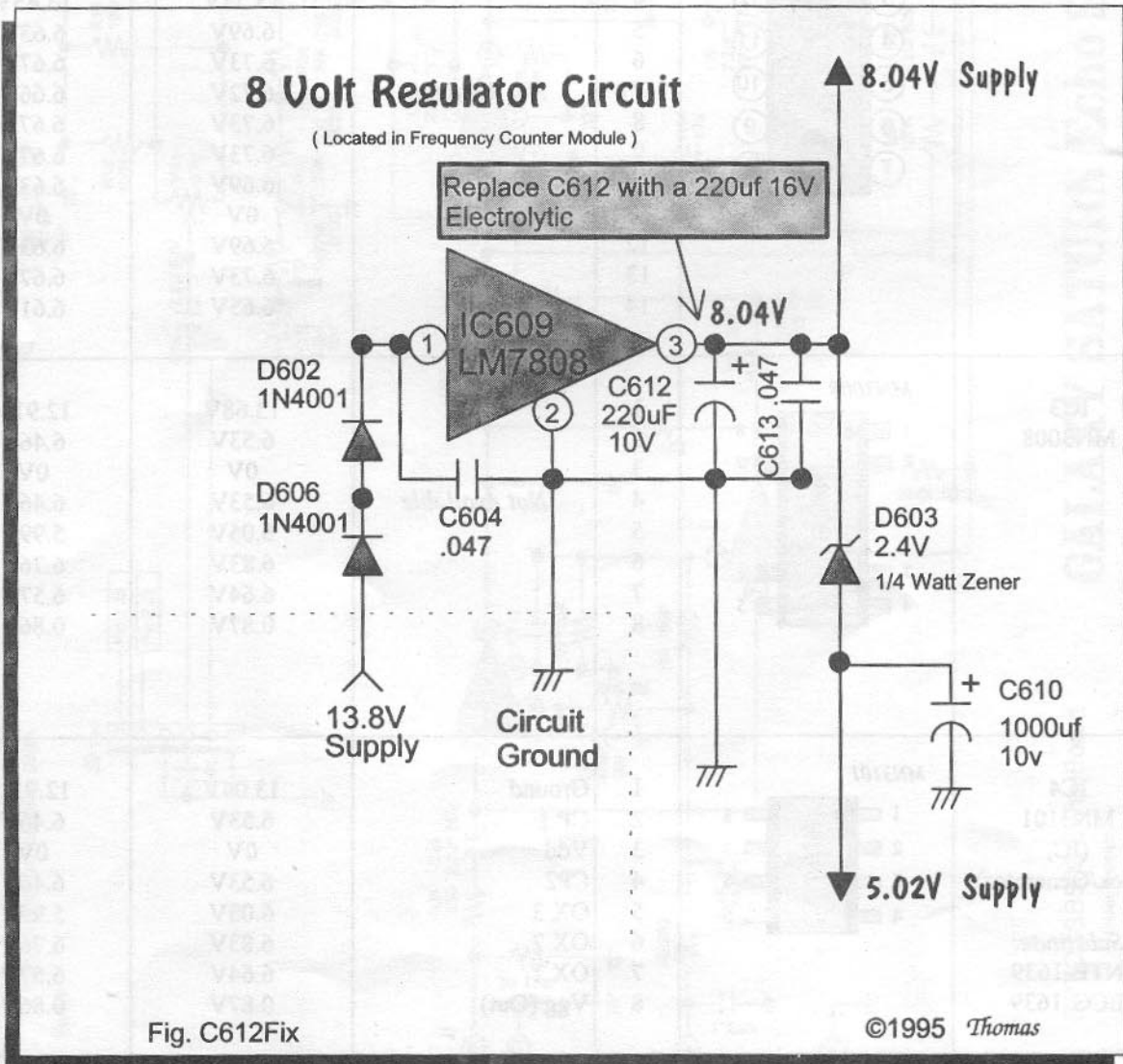


**PROBLEM:** Frequency Counter does not operate.

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.

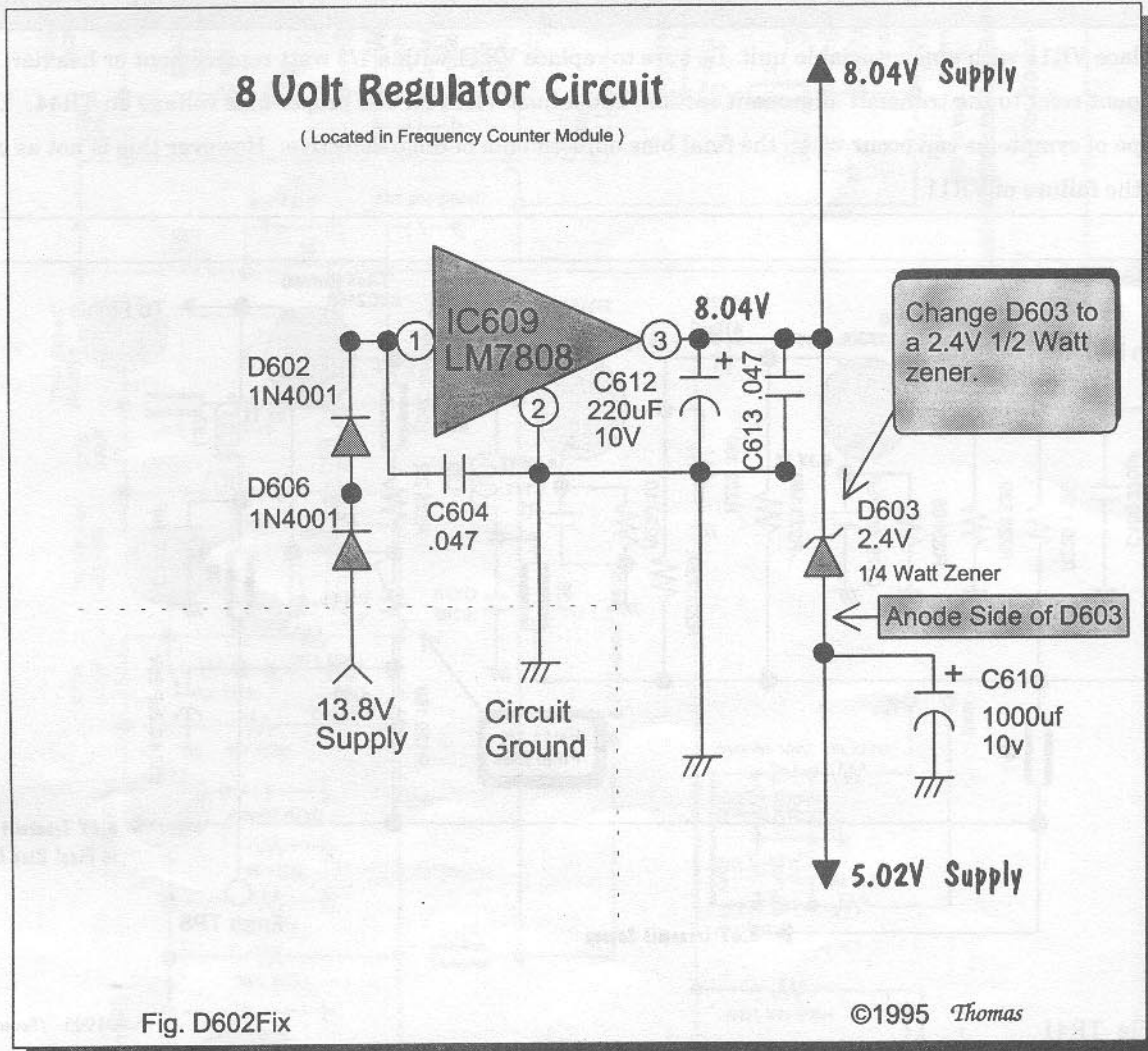


**PROBLEM:** Frequency Counter unstable or no operation.

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 - (1000µf 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.

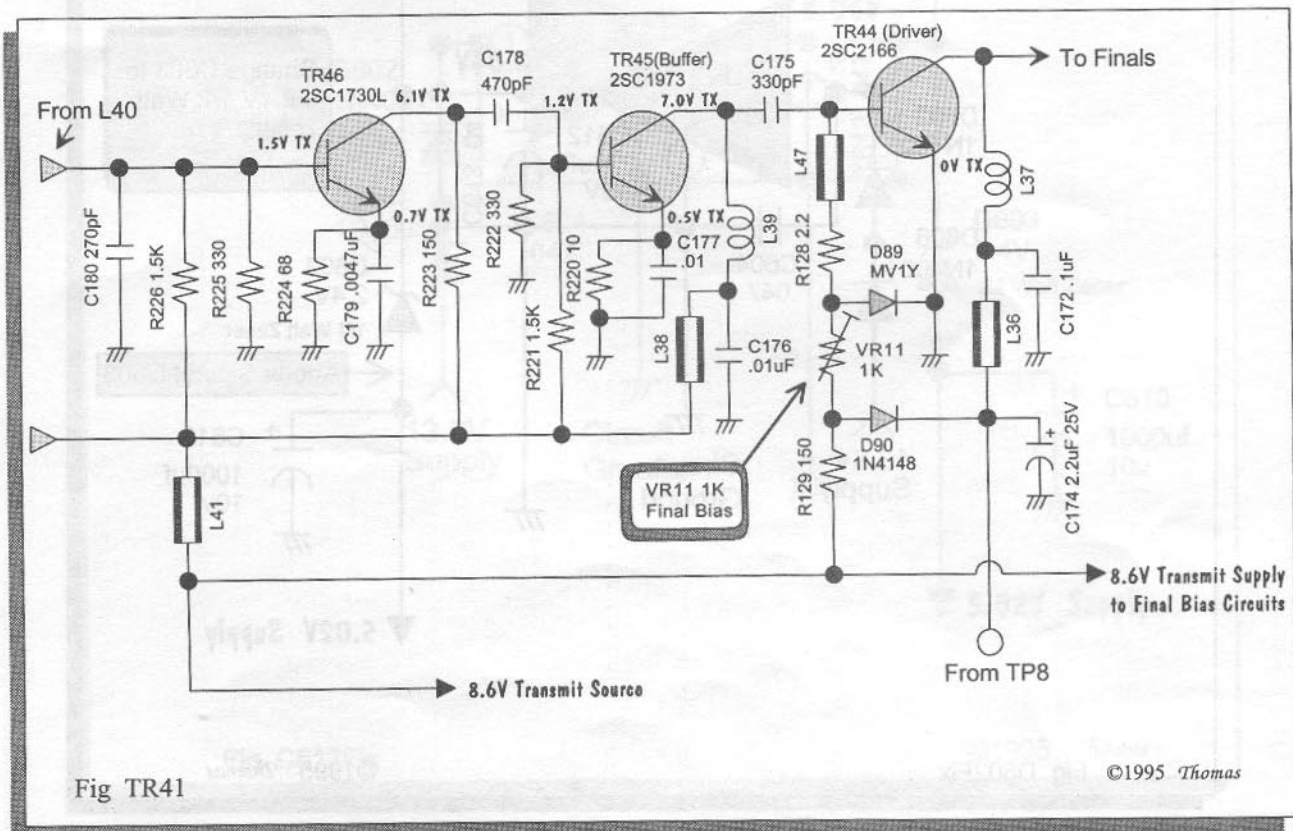
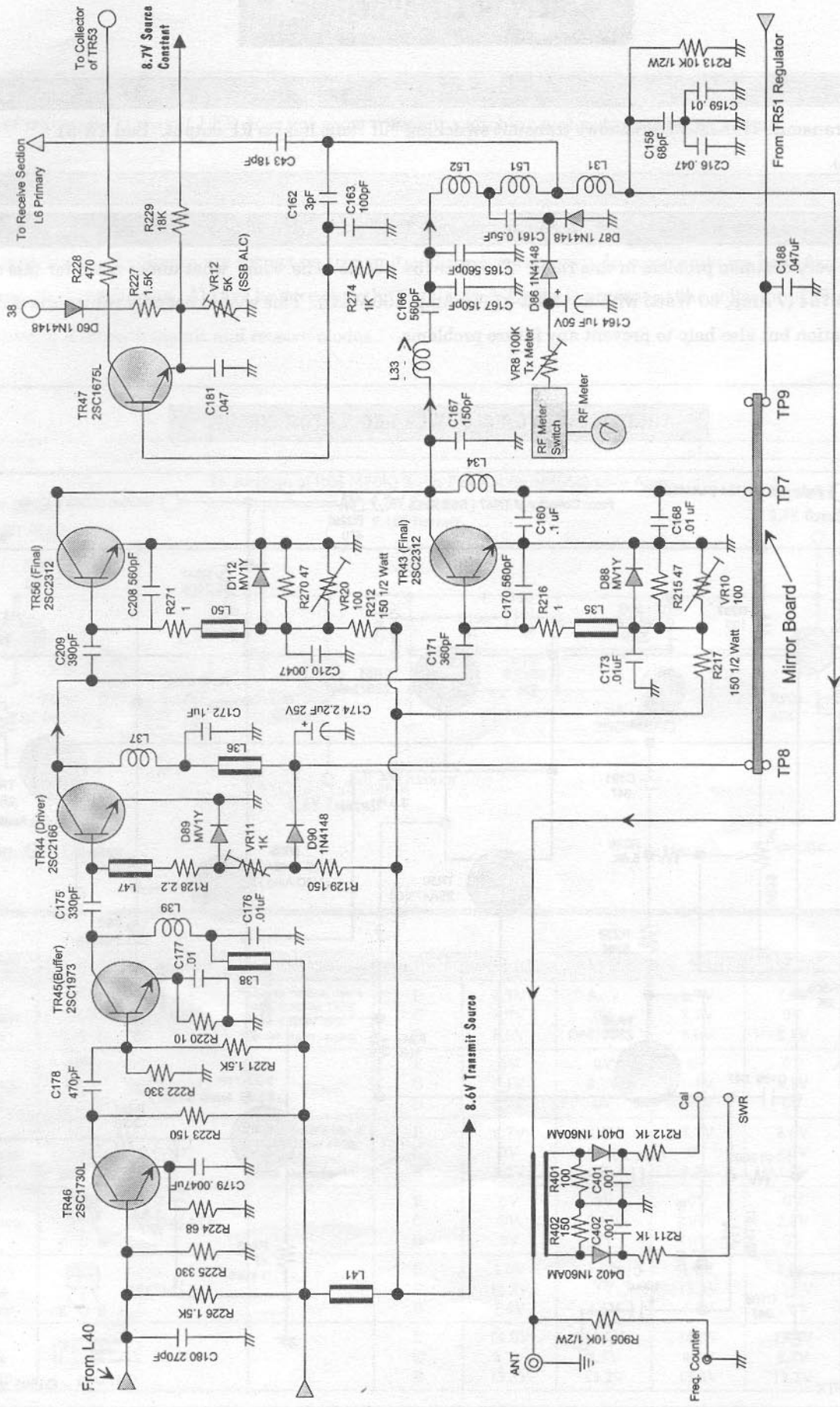


Fig TR41

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# GALAXY FINAL TRANSMIT SECTION



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Fig. GalTx



## 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

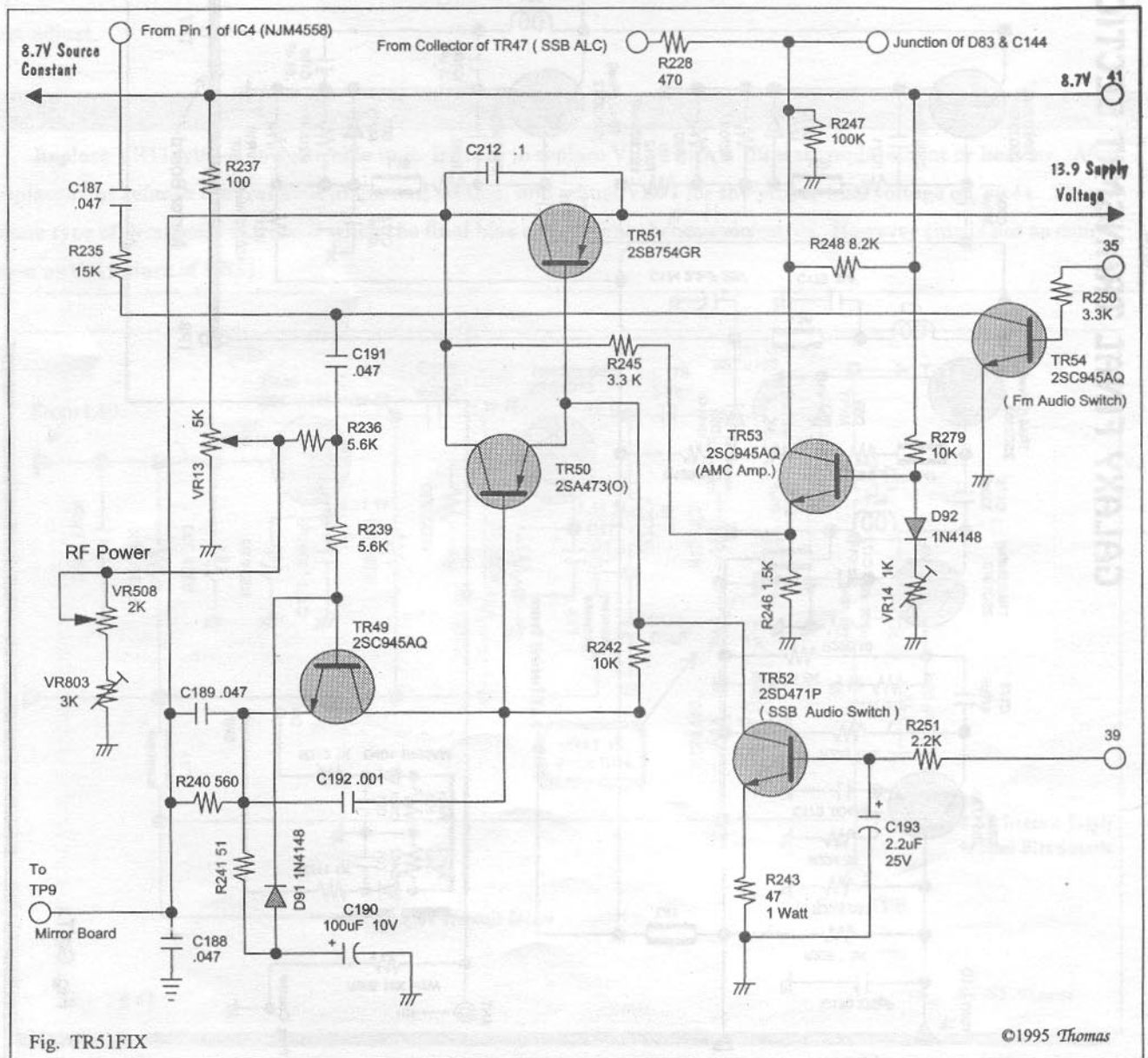


Fig. TR51FIX

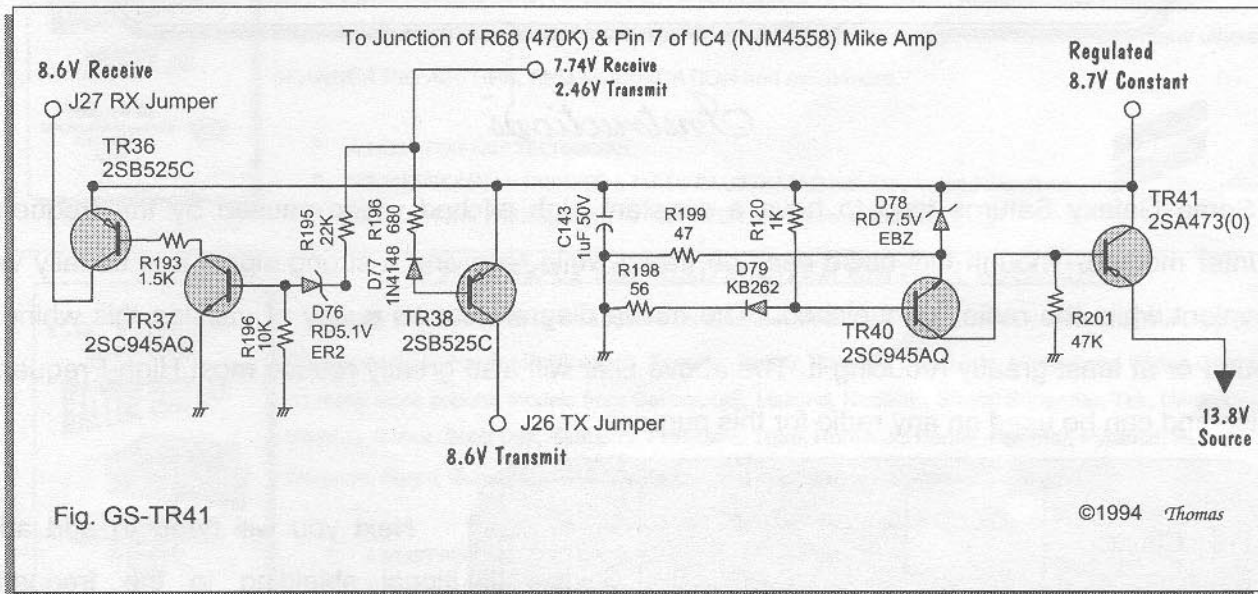
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## PROBLEM:

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.

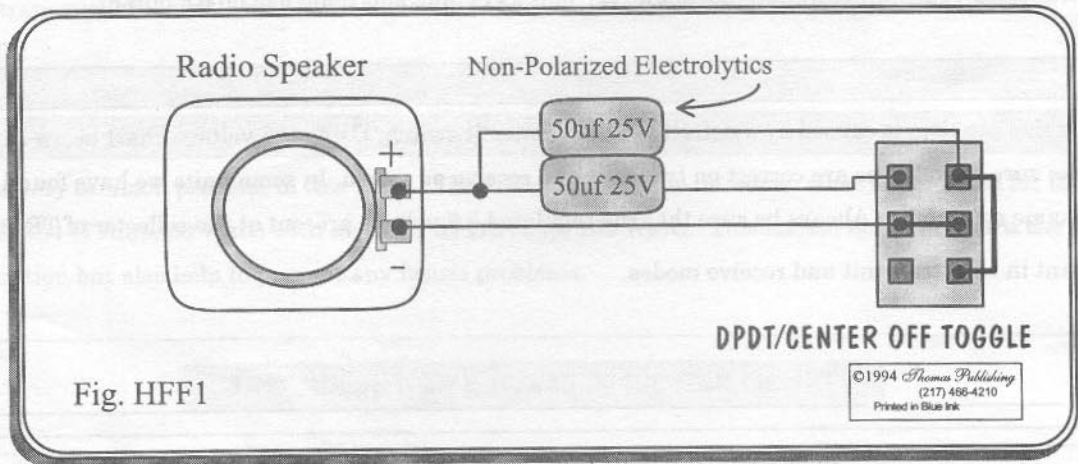


| DEVICE                       | PINOUT   | REMARKS  | PIN         | AM RX                  | AM TX                  | FM RX                  | FM TX                  | SSB RX                 |
|------------------------------|----------|--|-------------|------------------------|------------------------|------------------------|------------------------|----------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



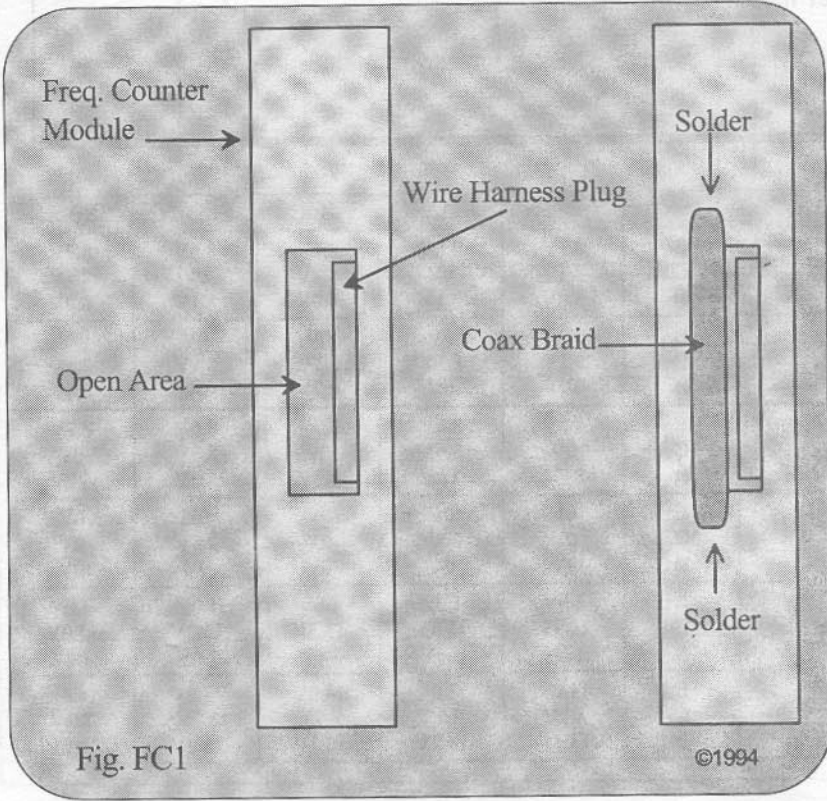
# GALAXY SATURN

## 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.