SERVICE MANUAL
solid state integrated stereo receivers

R33AS  R36AS

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where innovation is a tradition

price $6.00
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Equipment Required

Audio Oscillator (H.P. 200CD or equivalent)
THD 0.25% maximum
Frequency Range 20Hz - 20KHz min.

AC Voltmeter (H.P. 400CD or equivalent)
Range 3mV - 30V rms minimum

Volt-Ohm Meter (Triplet Model 630 or equivalent)
20,000 Ohms per Volt DC
20 Ohm internal resistance on 12mA range

Harmonic Distortion Analyzer (H.P. 331A or equivalent)

Oscilloscope (RCA W091A or equivalent)

Two 8 Ohm Resistive Loads
Minimum of 30W dissipation

Variable Transformer or 120V regulated line

Set Controls as Follows

Input Selector - "EXTRA"
Mode Switch - "STEREO"
Tone Controls - Flat
Volume - Minimum
Balance - "0" Center
Speaker Switch - Spkr 1 - "ON"; Spkr 2 - "OFF"
Power Switch - "OFF"
Comp Switch - "Volume"
1. **Resistance Checks**

Check both sides of power cord to chassis - Read 650K Ohms
With negative lead on chassis, measure collector resistance.

- R33 - Q609 and Q610 - Approx. 7K Ohms
- R36 - Q641 and Q661 - Approx. 7K Ohms

2. **Power On Voltages**

**Supply Voltage**
- R33 - +52V DC
- R36 - +65V DC

**Driver Balance**
- R33 - Collector of Q611 and Q612 - +26V DC
- R36 - Terminals 8 and 15 - +32V DC

**Voltage Regulator**
- Pin 7 should be +13V - Adjust VR801 if necessary

**Driver Bias Adjustment** (using Triplett 630 VOM on 12mA range)
- R33 - Adjust VR603 and VR604 for 0.5mA across R627
- R36 - Adjust VR601 and VR621 for 0.8mA across R642

3. **Amplifier Measurements**

Connect Audio Oscillator at 1,000Hz to left "Extra" input. 0.5V +2dB
Connect 8 Ohm loads to "Spkr 1" terminals. Turn volume control to maximum. Observe output level.
- R33 - 12.6V rms (20 Watts)
- R36 - 15.5V rms (30 Watts)

Repeat for right channel.
Push mode switch to "Mono". Increase input until output starts clipping.
- R33 - Adjust VR601 for symmetrical clipping of left output
- R36 - Adjust VR602 for symmetrical clipping of right output

Measure harmonic distortion
Should be less than 0.5% at rated output both channels
Return mode switch to "Stereo" position

4. **Tone Control Check**

Adjust input for 0dB output (.78V)

<table>
<thead>
<tr>
<th>Bass 100Hz</th>
<th>Treble 10KHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boost</td>
<td>10  +2dB</td>
</tr>
<tr>
<td>Cut</td>
<td>10  -2dB</td>
</tr>
</tbody>
</table>
5. **Frequency Response** - at 0dB output

+1dB 25 to 15KHz
3dB down points 17Hz and 25KHz

6. **Noise Filter Check** - at 10KHz

Note drop of 10 +2dB with filter "In"

7. **Comp Switch Check**

Adjust input for 0dB output with volume control at 10 O'Clock
Reference 1KHz

<table>
<thead>
<tr>
<th>Comp switch at</th>
<th>Volume</th>
<th>Loudness</th>
</tr>
</thead>
<tbody>
<tr>
<td>100Hz 0dB</td>
<td>100Hz +10 +2dB</td>
<td></td>
</tr>
<tr>
<td>10KHz 0dB</td>
<td>10KHz +2 +1dB</td>
<td></td>
</tr>
</tbody>
</table>

8. **Pre Amp Gain Tests**

Attenuate input 46dB from level in step 4
Connect input to "Phono" and switch selector to "Phono"
Volume at maximum. Note output of 0 +2dB at 1KHz.

Response Check

<table>
<thead>
<tr>
<th>1KHz 0dB (reference)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10KHz -13 +2dB</td>
</tr>
<tr>
<td>100Hz -13 +2dB</td>
</tr>
</tbody>
</table>

9. **Hum and Noise Measurements**

<table>
<thead>
<tr>
<th>Position</th>
<th>Volume</th>
<th>Input</th>
<th>Output (hum &amp; noise)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra</td>
<td>Min.</td>
<td>Open</td>
<td>3mV</td>
</tr>
<tr>
<td>Extra</td>
<td>Max.</td>
<td>Open</td>
<td>5mV</td>
</tr>
<tr>
<td>Phono</td>
<td>Max.</td>
<td>Shorted</td>
<td>15mV</td>
</tr>
</tbody>
</table>

Repeat steps 4 to 9 for right channel
Equipment Required

- Vacuum Tube Voltmeter: H.P. 400D
- Oscilloscope: RCA W091A or equivalent
- Volt-Ohm Meter: Triplet 630
- Distortion Meter: H.P. 331A
- FM Generator (or source): Measurements Mod. 88
- MX Generator (or source): Scott Mod. 830
- Audio Generator (or source): H.P. 200CD

Set Controls to the Following

- Input Selector Switch: FM
- Muting: OFF
- Mode: STEREO

Preliminary Checks

Inspect unit for defects, such as broken wafers, cracked terminals and jacks, loose transformers, binding tuning condenser, broken components, lead dress, scrap in unit, etc. Make certain all transistors are firmly seated in correct sockets. Take output from tape out jacks.

Switch unit on, check voltage at power supply board. Terminal 8 should measure +12 ±1V.

1. Mono Alignment and Sensitivity Check

   Front End and IF Alignment

   With about 10 μV generator output, align and peak front end for maximum output.
   With 3 μV input, align IF's for maximum audio. (IF's are pre-aligned, adjust only if repairs are made which dictate realignment)
   With 1 or 2K μV input, align detector for minimum distortion, (0.5% or less). On R36 adjust top slug of detector for meter centertune on hash. Adjust bottom slug for minimum distortion.

2. Sensitivity and Distortion

   Measure sensitivity of tuner with 2.2 μV RF input. Must obtain 30dB usable sensitivity at 92, 98, and 106 MHz.
   Recheck distortion, 2K μV input. 400Hz - maximum distortion of 0.5%. Audio output 1.5V ±2dB.

3. FM Hum Check (1.0mV on antenna terminal)

   Switch modulation OFF, measure minimum of 65dB reduction of output.
4. **Deemphasis Check** (1.0mV on antenna term.)

Tune to 92 MHz (change mod. to 8.2 kHz), note decrease of 12 +2dB in output.

5. **Calibration Check**

Check calibration against stations - max. tolerance +0.2 MHz.

6. **Multiplex Alignment**

a. Connect audio oscillator, tuned to 67 kHz, to input (term. No. 1 & GND) adjust T302 for minimum indication at TP-2 as observed on oscilloscope.

b. Tune front end to stereo signal and adjust T301 for straight base line of composite signal when observed on oscilloscope using low capacitance probe.

c. Move probe to TP-1, peak T303 and T304 for max. 19 kHz.

d. Move probe to TP-3 and adjust T305 for max. 38 kHz.

e. Adjust T305 for 40dB separation at TAPE OUTPUT JACKS, slight touch-up of T303 and T301 is permitted to obtain rated separation.

f. Check stereo distortion (1.0mV input) max. 0.7%

7. **Centertune, Muting and Stereo Threshold Adjustment**

a. Tune front end to mono signal, (1.0mV input), max. meter indication, check harmonic distortion which must be 0.5% or less. (DO NOT READJUST TUNING FOR BALANCE OF ITEM No. 7 ADJUSTMENTS). If necessary, adjust detector T203 and T204 for centertune indication on meter of R36 - Recheck harmonic distortion.

b. Adjust VR201 for unit to switch from the MUTED condition (push-button IN) with 2.5-7uV on antenna terminals.

8. **Final Listen Check**

Check all inputs and outputs (including phone jack), switches, and controls for proper operation. Check over-all appearance and for scrap inside unit. Check for proper switching of stereo light and squelch circuit. Check calibration against stations - specs are within 0.2MHz. Perform factory dielectric test. (1100 vac between chassis and power transformer primary).
1. **455 kHz Alignment**

Set tuning to middle of AM band, 1000 kHz. Output from Left Tape Out jack. Input from 455 kHz generator to AM loop antenna. With 2mV or less generator output peak all IF coils, T101, T201, T202, T203, T204 and T205 for max. output, keeping input level as low as possible.

2. **Oscillator Adjustment**

With tuning condenser maximum capacity (fully closed) adjust pointer to "0" logging, left edge of dial. Couple output of AM generator (600kHz modulated to 60% with 400Hz) to loop-stick with AM coupling loop. Tune unit to 600kHz. Attenuate input of RF signal until signal level is just noticeable on scope (using maximum usable scope sensitivity). Adjust oscillator coil (T102) for output peak, as read on VTVM. Set AM generator to 1600kHz modulated to 60% with 400Hz.

Tune unit to 1600kHz. Adjust oscillator trimmer for maximum output, as read on VTVM, using weak RF input signal.

Repeat the above adjustments of oscillator coil and oscillator trimmer until no further improvement can be made.

3. **Antenna Trimmer Adjustment**

Set AM generator to 1400kHz modulated to 60% with 400Hz. Tune unit to 1400kHz. Adjust antenna trimmer (TC5) for maximum output, as read on VTVM, using weak RF input signal.

4. **Tune to 600kHz and adjust ANT., tuning for maximum output.**

5. **AGC Potentiometer Adjustment**

Tune unit to 1.0MHz. Couple output of AM generator to loop for 300mV/M. Adjust VR201 (on IF board) for OUTPUT VOLTAGE of 0.6 - 0.95 volts. Harmonic distortion must not exceed 0.9%.

6. **Sensitivity Measurements**

Tune unit and generator to 600kHz. With coupler installed in the "MEASUREMENTS" position, attenuator set for 22uV (-50dB). Audio output must be between 0.3 and 0.6 volts.

7. **Repeat above measurements at each 200kHz point above 600kHz and note that output measures between 0.3 and 0.6 volts.**
8. **Calibration**

Check calibration at 200kHz intervals. Maximum calibration error shown in chart below. Using AM signal available at test bench attenuator.

**Calibration**

<table>
<thead>
<tr>
<th>Frequency (kHz)</th>
<th>Error (kHz)</th>
</tr>
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<tbody>
<tr>
<td>800</td>
<td>+10</td>
</tr>
<tr>
<td>1000</td>
<td>+20</td>
</tr>
<tr>
<td>1200</td>
<td>+20</td>
</tr>
<tr>
<td>1400</td>
<td>+10</td>
</tr>
<tr>
<td>1600</td>
<td>+10</td>
</tr>
</tbody>
</table>

9. **AM Final Listen**

Using headphones plugged into the front panel phone jack and loudness control adjusted for adequate output, slowly tune across the AM dial, listening for oscillations and no output.

Remove shorting bar on external antenna. Connect outside antenna to unit. Check calibration and tuning meter indication, using stations. Remove outside antenna, replace shorting bar and tighten screws. Turn AC power off and remove headphones from unit. Remove all test cables.
<table>
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<tr>
<th>SYMPTOM</th>
<th>LOCATION</th>
<th>CHECK</th>
</tr>
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<tbody>
<tr>
<td>No Power</td>
<td>Rear Panel</td>
<td>Power Fuse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power Cord</td>
</tr>
<tr>
<td>Blows Power Fuse</td>
<td>Driver Board</td>
<td>Q609, 610, 611, &amp; 612 (R33)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q641, 642, 661, &amp; 662 (R36)</td>
</tr>
<tr>
<td></td>
<td>DC Regulator</td>
<td>D801 - 804 Shorted</td>
</tr>
<tr>
<td></td>
<td>Chassis</td>
<td>C503 Leaky</td>
</tr>
<tr>
<td>No Output all positions</td>
<td>Rear Panel</td>
<td>Speaker Fuses</td>
</tr>
<tr>
<td>Unit lights up</td>
<td>Tone Control</td>
<td>B+ on pin 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q501 &amp; Q521</td>
</tr>
<tr>
<td></td>
<td>Driver Board</td>
<td>B+ and Balance Voltages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C613 &amp; C614 (R33) Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C641 &amp; C661 (R36) Open</td>
</tr>
<tr>
<td>No Phono</td>
<td>Preamp Board</td>
<td>B+ on pin 5</td>
</tr>
<tr>
<td></td>
<td>Input Switch</td>
<td>Check Continuity</td>
</tr>
<tr>
<td>No FM</td>
<td>Front End</td>
<td>+12V on pin 4</td>
</tr>
<tr>
<td>Normal Background Noise</td>
<td></td>
<td>Q1, 2, 3, and 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L1, 2, 3, 4, and 5</td>
</tr>
<tr>
<td>FM Completely Dead</td>
<td>FM IF Board</td>
<td>Q201</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IC201 &amp; IC202</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q205 &amp; Q206</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T202, 203, and 204</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check +12V on pins 2 and 10</td>
</tr>
<tr>
<td></td>
<td>Multiplex Board</td>
<td>+13 on pins 3 and 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+35 on pin 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IC301</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q301, 302, and 303</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T301 &amp; T302</td>
</tr>
<tr>
<td>Poor FM Sensitivity</td>
<td>Front End</td>
<td>Alignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q1, Q2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L1, 2, and 3</td>
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<tr>
<td></td>
<td>FM IF Board</td>
<td>Q201, 202, and 203</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IC201 &amp; IC202</td>
</tr>
<tr>
<td>No FM Stereo</td>
<td>Multiplex Board</td>
<td>Alignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IC301</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T303, 304, and 305</td>
</tr>
<tr>
<td></td>
<td>FM IF Board</td>
<td>Q207 &amp; Q208</td>
</tr>
<tr>
<td>SYMPTOM</td>
<td>LOCATION</td>
<td>CHECK</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>No AM</td>
<td>AM Front End</td>
<td>AM Antenna loopstick Open Q101 &amp; Q102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+12V on pins 3 and 5 T101 &amp; T102</td>
</tr>
<tr>
<td></td>
<td>AM IF Board</td>
<td>T201, 202, 203, 204, and 205 Q201 &amp; Q202</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D201 &amp; D202</td>
</tr>
</tbody>
</table>

**AM COUPLER**

**CIRCUIT DIAGRAM**

**MATERIAL - PHENOLIC**

**HOLES**
- A - "5/64" DRILL – 3
- B - "3/32" DRILL – 1

**WRAP 6 1/2 TURNS OF #24 INSULATED COPPER WIRE IN 3/16 GROOVE**
FET CONNECTION
2SK54 or 55
1  2  3
0  0  0
1. DRAIN
2. SOURCE
3. GATE

TRANSISTOR CONNECTION
2SC535
2SC461
1  2  3
0  0  0
1. Emitter
2. Collector
3. Base

(BOTTOM VIEW)

FM FRONT END
600-1015

UNLESS OTHERWISE SPECIFIED, ALL RESISTOR IN OHMS, 15% WATT.
ALL CAPACITOR IN MFDs, 50VW.

ALL VOLTAGES ±10%
AM FRONT END

AM LOOPSTICK ANTENNA
214-1005

AM AGC1.

AM AGC2.

+12VDC for AM

FET CONNECTION
2SK41(D)
1. DRAIN
2. SOURCE
3. GATE
(BOTTOM VIEW)

TRANSISTOR CONNECTION
2SC380A(O)
1. Emitter
2. Collector
3. Base
(BOTTOM VIEW)

NOTE:
UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE IN OHMS, 210% 1/4WATT.
CAPACITANCE IN MFD'S,
ALL VOLTAGES ±10%

TRANSISTOR CONNECTION
2SC373 or 2SC372
2SD313

1. Emitter
2. Collector
3. Base
(BOTTOM VIEW)

DC REGULATOR

Q801 2SD313 (D)
Q802 2SC372 (Y)
Q803 2SC373
D801 D803
D802 D804

+52VDC (R-33)
+65VDC (R-36)

+13VDC
+12VDC

REGULATOR PCB 400-1066

17
2SA493 or 2SC734
1 Emitter
2 Collector
3 Base
(BOTTOM VIEW)

2SC789
1 Base
2 Collector
3 Emitter
(BOTTOM VIEW)

2SC495
1 Emitter
2 Collector
3 Base
(BOTTOM VIEW)

GND

RIGHT INPUT

TP-1

POWER AMP PCB
400-1075

+52VDC

HF PRELOAD PCB
400-1074

LEFT INPUT

ALL VOLTAGES ±10%

Q601 Q602 2SA493 (GR)
Q603 Q604 2SC734 (O)
Q605 Q606 2SC495 (O)
Q607 Q608 2SC505 (O)

Q609 Q610 2SC789 (O)
Q611 Q612

R3AS POWER AMP.
DIAL CORD RE-STRINGING
PROCEDURE
FOLLOW SEQUENCE 1 THRU 7

3) 2 TURNS ON CORD DRIVE
CAPSTAN, STARTING ON SIDE NEAREST FLYWHEEL

2) DRESS OVER BOSS ON INSIDE OF PULLEY, FRONT END SIDE, THEN DIRECTLY TO PULLEY "A"

4) CONTINUE CORD INSTALLATION AROUND PULLEYS "B" THRU "F"

5) COMPLETE INSTALLATION WITH 2 TURNS OF CORD AROUND TUNING CAP DRUM, AND INSTALLATION OF TENSION SPRING

DIAL DRUM SPRING
TUNING CAPACITOR DRUM
6) TENSION ADJUSTMENT

START——
(TUNING CAPACITOR FULLY MESHECED)

7) SET AT ZERO LOG

A B C D E F