**SERVICE NOTES**

**First Edition**

**SPECIFICATIONS**

- **PITCH SHIFT RANGE**: PITCH A/B: ±1300 cents
- **ATTACK TIME**: 0-3 seconds
- **DECAY TIME**: 0-10 seconds
- **POWER CONSUMPTION**: 24 watts
- **DIMENSIONS**: 400(W) x 290(D) x 100(H)
- **WEIGHT**: GR-33B: 5Kg; G-33/G-88: 4.2Kg

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**Panel**

- **N-230**: (2221323000) LED GL-3AR2 (15029102)
- **Knob N-112**: (2247011200) large
- **Handle N-204**: (R/L same) (2231020400)
- **Washer N-701**: (221570101)

**Pots**

- **5 pcs**: EVHRRA360BS4 (13219104)
- **Knob N-113**: (2247011300) small

When replacing, place a washer on the top of pot's shaft for a space between knob bottom and panel top.

- **LED TLR-105**: (15029109)

**Switch**

- **w/matt**: (2312590300)

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**Power switch**

Common to all voltage areas

- **N-510**: (2247051000)

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**Flexible PCB**

- **N-214**: (2291016700)
- **Wiring ass'y**: N-208 (2281021401) (2231020800)

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**Chassis N-229**

- **(2281322900)**

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**Power transformer**

- **PT-N-185**: (22450185) 100V
- **PT-N-186**: (22450186G) 117V
- **PT-N-187**: (22450187D) 220/240V

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**Wiring ass'y**

- **N-207**: (2241320700)

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**VOICING BOARD**

- **G-9222-030**

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**Screw**

- **3 x 15mm**: SG-7630 (13449107)
- **3 x 6mm**: SG-7640R (13449202)

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**Jack**

- **SG-7630G**: (13449108)

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**Connector**

- **SLO-1204-2324F**: (13429405)

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**Rubber foot**

- **No.41**
CIRCUIT DESCRIPTION

GR-33B circuits are mostly built on two ICs: Voiceing Board OP-9222-030 and Control Board OP-9222-040.

1. FUNDAMENTAL DETECTOR

This detector, the heart of GR-33B, strips incoming signals off harmonics and leaves fundamental. In the following, only channel #1 circuit is described since this detector is composed of the same four circuits.

The output signal coming from the divided pickup is applied through LPF/BufferIC1a to COMPRESSION circuit consisting of clamp diodes D1-6e and D2-6e followed by another LPF IC1b.

1-1. Band-Pass Filter (BPF)

A two-stage filter, consisting of cascaded IC3a and IC4a, largely jumps its frequency response when a string is plucked with low fretting and then higher fretting, and vice versa. When channel #1 string at lower fret (0-6th) is played, Q3 and Q4 are cut off by the potential from IC4a whose pin 2 is kept positive with respect to pin 3 by T/V output (107b). Q3 and Q4, during off, make let and 2nd filters' component values the same to provide overall pass frequency at F1 that corresponds to fundamental of the open string. The filter attenuates the last overtone or 2nd harmonic content in the passing signal by 24dB.

Picking string with a fretting higher than point A in Fig. 1 causes 107b to output voltage below that on IC4a pin 3 whose output turns to positive. Q3 and Q4, during conducting period, connect R13 and R19 to circuit, making filters' constants different to each other. Results are discrete peak frequencies: F2a (frequency around 5-6th frets) from IC3b and F2b (around 18th) from IC3b. Second harmonics of fret notes in this region are also rolled off by 24dB.

NOTE:
These response curves do not affect sound volume since signal flowing through the filter is used only for pitch determinate. The fundamental is trimmed into squarewave in comparator IC5 and is fed to the next stage, T/V converter IC6, IC5 and 107.

2. T/V CONVERTER

This circuit is composed of two-stage monostable multivibrator IC5 (ML1, ML2), constant-current integrator Q6a, 107a, IC5, and sample and hold circuit IC8 and 107b. ML1 and ML2 output along with positive-going pulses ~a and ~a upon receiving edges of respective inputs. There is time lapse with ~a and ~a due to the time constant of R36 and CV03's input capacitance.
4. GATE GENERATOR

The gate generator comprises three circuits:
- Peak Hold 102a, D4 and Q9: Reset 103a and Q2; Reset Disable: D5, C8 and Q1 - and GATE output 102b.
4-1. Peak Hold
When picked signal is applied to pin 3 of 102a, it charges Q9 through D4 during ATTACK time. The chargeable potential is proportional to the signal peak and may be varied from picking to picking. 102b delivers this voltage as a gate signal at a constant level until Q2 is fired by reset signal. The signal output at 102a pin 3 is decreasing after attack time is finished, to the level below that on pin 2 when 102a turns pin 1 to negative going. 24 being reverse biased, Q9 still holds previously charged voltage.
4-2. Reset
Comparator 103a senses voltage difference between the E/VS and E/HS outputs, which will be caused by complex harmonics content in string signal at picking and by 2nd harmonic at decay time. Voltage difference between pins 2 and 3 of 103a turns pin 1 to positive that conducts Q2 via D5, turning 102b pin 7 (gate out) to Q9. Reset signals that are inevitably presented to D5 anode should become inoperative during attack time to reproduce very important edge of sound. Below describe how this is done.
4-3. Reset Disable
During attack time 102a charges Q9 through D5 and conducts Q1, shifting positive output voltage from 103a pin 1 to below D5 forward bias voltage. Duration of this state is determined by E/HS time constant because D5 anode will go to negative after attack time is over as explained above in 4-1.
CONTROL BOARD: GP-9222-040

5. V/F CONVERTER (VCO)

This V/F converter is similar to the F/V Converter in operation. When the charge on C16 increases constantly and reaches the potential equal to that on C18, it causes output from 109b to conduct Q6 and Q7 of sawtooth waveform whose amplitude is inversely proportional to fret frequency, that is, the lower the fret, the higher the amplitude of VCO waveform can be modulated or shifted by varying the current flowing into C16. The more the current, the faster charges C16 up to the level on C18. As a result, VFO frequency increases with its amplitude held constant.

1. FOOT SWITCH CONTROL

Pressing the footswitch (momentary-close type) applies trigger pulse to clock pin of flip-flop 101-103 through buffer 104. In this configuration: D4-F/F is connected as type T-F/F. Capacitor C1, Q4, and D1 across the switch prevents contact bounce (chattering) which could cause false triggering.

POWER RESET 102a generates initial reset pulse for other F/Fs when the power is turned on. Outputs from LED DISPLAY 104, D5, Q4 and F/F are fired at the base of LED driver Q1.5,5,5,6, 7. LED blinks at the rate of oscillator output when F/F is reset.

2. LPO

One half of I05 forms hysteresis comparator and the rest half acts as a miller integrator, generating triangular output waveform. The waveform is directed to VCO MOD on V0109G board via 106 whose gain is current controlled by VIB DEPTH from Guitar Controller.

3. VCO MOD (FITCH SHIFT)

When FITCH A (B) is pressed, it causes Q6(Q7) connecting to pin FITCH A(B) to be turned on, voltage set by the pot is fed via 107a to Q9 (antilog) at VCO MOD on V0109G board.

4. VOF

One chip VOF (IC11 131050) comprising antilog circuit makes up 12 dB/oct LF even along with its external R1 and C6. The output is positively fed back to its input for resonant effect through Q17 and VOA 1310 whose gain or amount of resonance is controlled by RESONANCE on guitar controller.

When emphasis is high at a frequency, response curve lowers than the peak frequency decreases in level, resulting in relatively small VOF output in this region. This detrimental effect is compensated for by parallely feeding audio signals via VOA control amount of feedback and signals at the same rate. Besides various control voltages, pitch control voltage is fed to VOF control pin via 107a and I05a to shift VOF cutoff point in accordance with pitch shift at V90 to maintain suitable filter band width.

Each GATE GEN output from VO109G board is summed at I07b whose output level determines ENV GEN output level. The shape of ENV GEN output is determined by either A or B ATTACK and DECAY settings being selected by ENV A/B footswitch.

5. ELECTRONIC VOLUME CONTROL

Before being output from OUTPUT jacks, the audio signals are controlled their volumes by photoelectric cells FEN and FEN2 which in turn are remote-controlled at guitar controller.

Output from NOISE KILLER Q26 is also applied to FEN through Q27. When ENV GEN outputs zero volts, I07b is disabled, shutting in residual noises in the synthesizer channel.

0-35, 0-88

0-35 and 0-88 can be used as the ordinary electric bass guitar as well as a guitar controller dedicated to GR-33B. To make them operate as the bass guitar without connection to GR-33B, the circuits that process sound from single-coil pickup can operate from batteries built in.

1. BUFFER

To compensate for sensitivity variations among heads on quadruple pickup, outputs from I01 and I02 can be balanced in amplitude by adjusting individual trimmers (V91-V94).

2. TOUCH VIBRATO

When a player touches the one of Touch Plates, his body is connecting ground to pin 1 (6) of flip-flop(I04- 0, d), causing; (1) the pin voltage to down below threshold, (2) F/F to reverse its output to L, (3) IC11 gate(I04a) to output H, which is inverted through I05, potential divided by W91-1320, to divide resistor 0.13. Since pin 1 of I04a is lead to the touch plate named F.TOUCH, pin 3 goes to L as soon as hand leaves of the plate.
GR-33B

ADJUSTMENTS

If tailpiece, bridge, truss rod and/or pickup(s) have been removed on a given Guitar Controller, or if it seems to be aged or in such conditions under which appropriate play cannot be performed, proceed to adjustments in the order numbered:

1. PRELIMINARY; 2. TRUSS ROD; 3. STRING HEIGHT; 4. STRING LENGTH

PRELIMINARY ADJUSTMENT

Tighten the strings to eliminate slack. Check Divided and Bass pickups for clearance from strings.

Lower the pickup, if the top face touches any strings, enough to allow of picking.

Tune the Guitar to playing pitch in Bass set-up.

TRUSS ROD

- Checking Fingerboard and Neck for Cambered, Pulled, Twisted - see Fig. 1

Hold the neck joint with one hand(1); with the other hand, gently hold the guitar head(2). Position the guitar on the table. View the curve of the fingerboard and neck across the top of the head from both edges alternately(3). With Bass guitar, neck of slight concave bend is considered ideal. Fig. 1A.

B to H in Fig. 1 are as examples would occur. Of course any combinations of these examples might be found on the guitar.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
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<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
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<tr>
<td>(3)</td>
<td>(4)</td>
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</table>

To adjust truss rod, remove the rod cover. Tighten or loosen the nut(4) with an 8mm nut driver, small degree at a time while checking the result. DO NOT OVER TIGHTEN.

B, C, D —- Adjust truss rod. Check that there is no buzzing when the strings are played open. (Light curvature dashed in D can be ignored.)

E, F, G, H — when possible action cannot be obtained after compensation by truss rod adjustment, any adjustments it needs should be left to someone with experience in guitar repair.

ACTION (STRING) HEIGHT

- Bridge, Divided Pickup -

Since bridge height has great effect on divided pickup’s sensitivity, adjustment for the one should be associated by for the other.

PRECAUTIONS

Eliminate bridge whose stud(s) does not slip into grooves. Fig. 2.

Bridge height and position on the bridge frame should be determined with the strings at tuned tension, which may be loosened slightly for easier bridge movement.

BRIDGE HEIGHT

Action height adjustments must be taken with a full set of strings on the guitar, the gauge and type will be used, tuned to playing pitch.

With the strings upon, measure the distance between 12th fret and the bottom of 1st and 4th strings.

Standard clearances: 1st -- 2.0mm, 4th -- 3.0mm Fig. 3

To adjust bridge height, turn two adjustment nuts using hexagonal nut driver as shown in Fig. 4. Keep bridge top plane as parallel with bridge frame face as possible. Fig. 5

DIVIDED PICKUP HEIGHT

- Coarse -

Raise divided pickup by turning height adjustment screws alternately until #1 and #4 heads contact with string. If #2 or #3 touches first, raise corresponding bridge.

(re-)adjust #2 and #3 bridges' height for the same string contact as #1 and #4.

- Fine -

After all strings rest on heads, readjust pickup height for the following clearances with respective string fretted at 12st.

Between #1 head top and string bottom --- 1.5mm

Between #4 head top and string bottom --- 2.0mm

STRING LENGTH (OCTAVE ADJUSTMENT)

Test intonation at the 12th fret whether string is sharp or flat in terms of overall intonation.

If a string is going sharp at the 12th fret, move back the bridge to add string length by turning the intonation adjustment screw at the bridge frame (Fig. 4). If flat, forwards.

BASS GUITAR PICKUP (Single-Coil) HEIGHT

Possible action on guitar pickup (polepieces/string bottom) depends greatly on strings and players, with strings supplied 4-5mm works well. However, pickup's top surface must be held parallel to the strings.
UNIFORMING PICKUP HEAD SENSITIVITIES
Replacement of Preamp Board or Divided Pickup, or readjustment of the pickup height, all requires VR1-VR4 of Preamp board to be readjusted for uniform head sensitivities. Remove battery cover, batteries and rear panel. Connect 0-33 to GR-33B. Scope to TP-1 of VOICING board. Set controls as shown above.

Play controller in a way ordinary electric bass guitar is played. Avoid using peculiar technique. While plucking, set VR1-VR4 respectively (see note at the right) for the same amplitude (max. approx. 20Vp-p). VR1-VR4 do not take wide travel range before they change buffer gain drastically. So by degrees at a time.

BALANCING SYNTHESIZER & BASS SOUND LEVELS
No standard is applied to this adjustment. Synthesizer sound is largely variable as controls setting is changed, especially CUTOFF FREQUENCY and RESONANCE.

Presume the player's routine knob settings. Compare synthesizer sound with bass sound by switching VOICE SELECT. Readjust the trimmers as necessary (VR1-VR4).

Effective serial number to the modifications is not strict. Both types would be present on products bearing the same lot number, mostly 030400-040599.

NOTE:
As can be seen in the figure below, clockwise rotation in trimmer on early pcb increases buffer gain. On later pcb the reverse will be true.

Serial Number up to 030499

Serial Number 040500 and subsequent
ADJUSTING VCF

DO NOT ATTEMPT THIS ADJUSTMENT PRIOR TO COMPLETION OF VCO TUNE

CUTOFF FREQUENCY

1. Turn R18 VR13 fully clockwise (CW), through hole in the pcb from the foil side. VCF will resonate when a string is plucked.

2. Play string at open and adjust CUTOFF VR2 for 9kΩ. Fig. 1.

Set controls as illustrated at the right (footswitches: all off). Connect oscilloscope to MIX/SYNTH jack.

CONTROL

OP9222-040 (7922204001)
 pcb 2291334303

RESONANCE

1. With VR13 at CW, re-set CUTOFF FBQ on 8-33/6-85 to 5.
2. Pluck 2nd string at open. Adjust VR13 for A:B = 2:1. Fig. 2.

VCA OFFSET BALANCE

Set BAL VR1 for CV at IC8 pin 7 with no input signal applied.
Set controls on guitar controller and GR-33B as illustrated above.

1. Set each TUN VR1(#1-#4) at its midpoint.
2. Play on 1st string at 12th fret. Beat notes will be heard. Tune VCO by turning TOTAL TUNE(trimmer) VR2 until zero beat is heard. Do not turn VR1.
3. Pluck 2nd string with 12th fretting. Set VR1 on channel #2 for zero beat.
4. In the same manner tune #3 and #4 VCOs.
5. Check all strings for detune at open string and 21st fret notes.
6. Fine tune every VCO with VR1 over a string scale.
TLO82's of a color duplicate each other in terms of offset characteristic. In a channel, use a pair of the same colored to match them for close voltage processing. Pairs in different channels can be in different colors.
## GR-33B Parts List

### Transistor

<table>
<thead>
<tr>
<th>Transistor</th>
<th>SEMICONDUCTOR</th>
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<tbody>
<tr>
<td>1511906</td>
<td>28A753</td>
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<td>1511918</td>
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<td>1512913</td>
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### Diode

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<tr>
<td>1501912</td>
<td>1B180RM</td>
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<tr>
<td>1501903</td>
<td>1B247</td>
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<tr>
<td>1501908</td>
<td>1B2473FV</td>
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<tr>
<td>1501926</td>
<td>W-02 rectifier stack</td>
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<td>1501948</td>
<td>K1236BF</td>
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<td>1522990</td>
<td>K6B-350561</td>
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<tr>
<td>1532910</td>
<td>TL-105 LED foot switch</td>
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<tr>
<td>1532912</td>
<td>GL32AR2</td>
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### IC

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<td>15199102</td>
<td>MC1401BF</td>
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<td>15359125</td>
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### Power Transformer

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<td>2245012580</td>
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<td>PT-R-167</td>
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### PCB Assembly

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<td>7922203002</td>
<td>GP9222-020 VOICING</td>
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<tr>
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<tr>
<td>792204001</td>
<td>GP9222-040 CONTROL</td>
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<td>229133453</td>
<td>Control less parts</td>
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### Potentiometer

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<tbody>
<tr>
<td>13219104</td>
<td>FVT88A360B54 50K</td>
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<tr>
<td>13219102</td>
<td>FVT88A360A26 2MA</td>
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<tr>
<td>13299106</td>
<td>SR186B7K4 47KB carbon trimmer</td>
</tr>
<tr>
<td>13299540</td>
<td>CRL18B1K8 1KB metal</td>
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<tr>
<td>13299544</td>
<td>QG19B22K 22KB trimmer</td>
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### Resistor

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<th>Resistor</th>
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<td>Metal film 1% GR285X</td>
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<tr>
<td>17769227D0 5K</td>
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<td>17769219D0 20K</td>
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<td>17769229D0 50K</td>
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<td>17769222D0 1M</td>
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### Connector

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<td>13429405</td>
<td>SLC-1204-2324F w/lock shell</td>
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<tr>
<td>12139502</td>
<td>SLC-1204-244L1 lock shell</td>
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<td>13429136</td>
<td>522-6A 6p</td>
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<td>13429143</td>
<td>522-7A 7p</td>
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<tr>
<td>3022-12A</td>
<td>12p</td>
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<tr>
<td>2341220700</td>
<td>Connector/wiring assy N-207</td>
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<tr>
<td>2341220800</td>
<td>Connector/wiring assy N-208</td>
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<tr>
<td>13439404</td>
<td>SLC-1204-1324K (0-24B)</td>
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<tr>
<td>13439404</td>
<td>SLC-1204-1324F (0-24D)</td>
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<tr>
<td>2291016700</td>
<td>Flexible PCB N-167 12p long</td>
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<tr>
<td>2291016600</td>
<td>Flexible PCB N-166 made out of N-167</td>
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<tr>
<td>13429121</td>
<td>PFL-1282-54DS 12P flexible PCB socket</td>
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### Switch

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<th>Description</th>
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<tr>
<td>2312390300</td>
<td>Switch N-903 foot w/matt</td>
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### Jack

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<tbody>
<tr>
<td>13449107</td>
<td>SG-7630</td>
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<tr>
<td>13449108</td>
<td>SG-7630G green</td>
</tr>
<tr>
<td>13449202</td>
<td>SG-7640 red</td>
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### Knock Button

<table>
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<th>Knock Button</th>
<th>Description</th>
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<tbody>
<tr>
<td>2247011200</td>
<td>Knob N-112 large</td>
</tr>
<tr>
<td>2247011300</td>
<td>Knob N-113</td>
</tr>
<tr>
<td>2247051000</td>
<td>Button N-510 power sw.</td>
</tr>
</tbody>
</table>

### G-33 Parts List

- **G-33**
  - 7923102003 GP9-223-020 PH8AOP
  - 229133401 Preamp less parts
- **PCB Assembly**
  - 13219106 EV12-RTA304B54
  - 13219763 EV12-RTA304B54 center detent
  - 13219766 SW1-XWA32285B 50KB x 2 dual ganged
- **Potentiometer**
  - 13299113 SR186B7K4 4.7K trimmer
- **Semiconductor**
  - 13439605 SLC-1204-2324W 24 conductors w/locking shell below
  - 134493902 SLC-1204-244L1 lock shell
  - 134493990 SLC-1204-244L1 lock shell
  - 134493902 SLC-1204-244L1 lock shell
  - 13429121 SLC-1282-244B8 12p flexible PCB socket

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**APR. 1, 1981**

**Switch**

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<td>K-020 large</td>
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<tr>
<td>2247019000</td>
<td>K-028 small black</td>
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**Guitar**

- **Divered pickup**
  - 2289352000 Divided pickup
  - 2293527300 Pickup holder (D.pickup)
  - 2293560500 Pickup PU-144 Bass
  - 2255300800 Pickup base (bass)
- **Bridge/tailpiece**
  - 2213330600 Bridge/tailpiece TP-150 brass
  - 2213330700 Bridge/tailpiece TP-151 nickel
  - 2283331300 Machine head PU-127 gold
  - 2283331400 Machine head PU-121 nickel
  - 2202316900 Adjust rod cover brass
  - 2202362100 Adjust rod cover plastic
  - 2283331100 End pin gold
  - 2283331200 End pin nickel
- **2219327400** Holder K-274 pcb housing frame
- **2202316600** Cover N-166 rear panel
- **2202316700** Cover N-167 battery compartment lid
- **2219506000** Holder K-106 (trimmer)