



# Build This Six-Transistor Low-Noise MC Preamp

By Rickard Berglund

This six-transistor low-noise distortion MC step-up uses a new circuit topology with three feedback loops. Input signal is fed to the emitter of transistors Q1 and Q4 and is amplified by transistors Q2 and Q5. Transistors Q3 and Q6 work as an output buffer. The collector voltage of Q1 and Q2 acts as the operating current of Q2 and Q5, and the resistors R4-7 set the operating voltage of transistors Q3 and Q6. With an excellent drive capability and stability into capacitive loads, the amplifier is symmetrical and is DC-coupled from input to output. Input impedance is 120Ω; output impedance is 200Ω. The bandwidth of the amplifier without L and C1 is 0-6MHz.

The output offset voltage is typically less than 10mV. If the offset voltage is a problem, place a coupling capacitor between the MC step-up and the RIAA

amplifier. The gain is set by the resistors R4 and R5 (Table 1). The inductance L and the capacitor C1 act as a filter to suppress radio frequency interference.

TABLE 1.

| R4, R5 | Gain | Gain in dB |
|--------|------|------------|
| 240Ω   | 12   | 21.5       |
| 270Ω   | 14   | 23         |
| 300Ω   | 16   | 24.5       |
| 330Ω   | 20   | 26         |

You can power the amplifier from a 12V lead-acid battery or a low-noise 12-18V power supply. Power consumption is 27mA with a 12V supply (325mW), 33mA with a 15V supply (500mW), and 40mA with an 18V supply (720mW). Shield the amplifier in a metal box for shielding, and place transistors Q1 and Q2 together so they have the same temperature. Also place transistors Q4 and Q5 close to each other. Eventually, glue the transistors to each other. *ax*

## PARTS LIST.

|        |                            |
|--------|----------------------------|
| C1     | 10nF                       |
| C2, C3 | 100μF 16V electrolytic     |
| F      | fusc 100mA                 |
| L      | 22μH                       |
| Q1, Q2 | low noise NPN transistor   |
| Q3     | BC547B or BC548B or 2N3904 |
| Q4, Q5 | low noise PNP transistor   |
| Q6     | BC557B or BC558B or 2N3906 |
| R1     | 150Ω                       |
| R2, R3 | 1000Ω 1%                   |
| R4, R5 | 240-330Ω 1% (see text)     |
| R6, R7 | 150Ω 1%                    |
| R8-10  | 24Ω 1%                     |
| R11    | 249Ω                       |

| Transistors Q1 and Q2    | Relative Noise |
|--------------------------|----------------|
| BC 639 Motorola          | 66             |
| BC 489A Motorola         | 71             |
| MPSA 42 ON Semiconductor | 73             |
| MPSA 42 Motorola         | 73             |
| BC 639 Fairchild         | 75             |
| BC 637 Siemens           | 77             |
| BC 487 Motorola          | 82             |
| BC 635 Philips           | 83             |
| 2N4401 ON Semiconductor  | 87             |
| MPSA 06 Fairchild        | 114            |
| MPSA 42 Fairchild        | 114            |

| Transistors Q4 and Q5 | Relative Noise |
|-----------------------|----------------|
| BC 878 Siemens        | 32             |
| BC 880 Siemens        | 33             |
| BC 636 Motorola       | 58             |
| BC 640 Motorola       | 65             |
| MPSA 56 National      | 66             |
| MPSA 92 Motorola      | 67             |
| MPSA 92 Multicomp.    | 74             |
| BC 640 Multicomp.     | 74             |
| BC 636 Siemens        | 75             |
| BC 640 Fairchild      | 77             |
| BC 369 Philips        | 98             |
| MPSA 56 Fairchild     | 100            |
| 2N4403 Motorola       | 101            |
| BC 640 Philips        | 114            |

## PARTS LIST FOR A LOW-NOISE POWER SUPPLY (ONE POWER SUPPLY FOR TWO MC STEP-UP AMPLIFIERS IN A STEREO SYSTEM).

|        |                                                                                 |
|--------|---------------------------------------------------------------------------------|
| Br     | bridge rectifier 40V 1A                                                         |
| C1, C3 | 2200μF 40V electrolytic                                                         |
| C2     | 220nF                                                                           |
| F      | 500mA slow-blow fuse                                                            |
| IC     | 7815                                                                            |
| R      | 1Ω 1W                                                                           |
| T      | transformer with a 15V 6VA secondary and a shield between primary and secondary |

