Contents

SPLITTER FOR S/PDIF COAX/OPTICAL OUTPUT

THIS circuit was originally designed to enable one S/PDIF output on a CD player to drive several inputs. The circuit acts as a 3-way splitter or format converter for S/PDIF ('digital') or optical signals. The function of the circuit is determined with the aid of two jumpers, as follows:

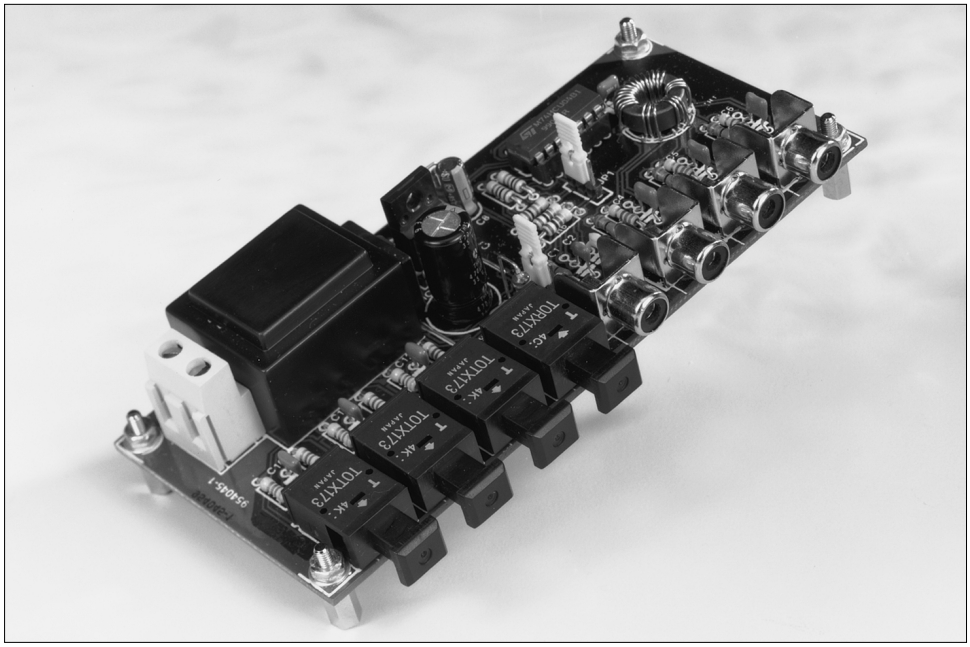
JP_1	JP_2	Function
O	O	optical input to optical and coax output
O	A	optical input to optical (buffered) and coax output
C	O	optical input to optical output, coax input to coax output
C	A	coax input to optical and coax output

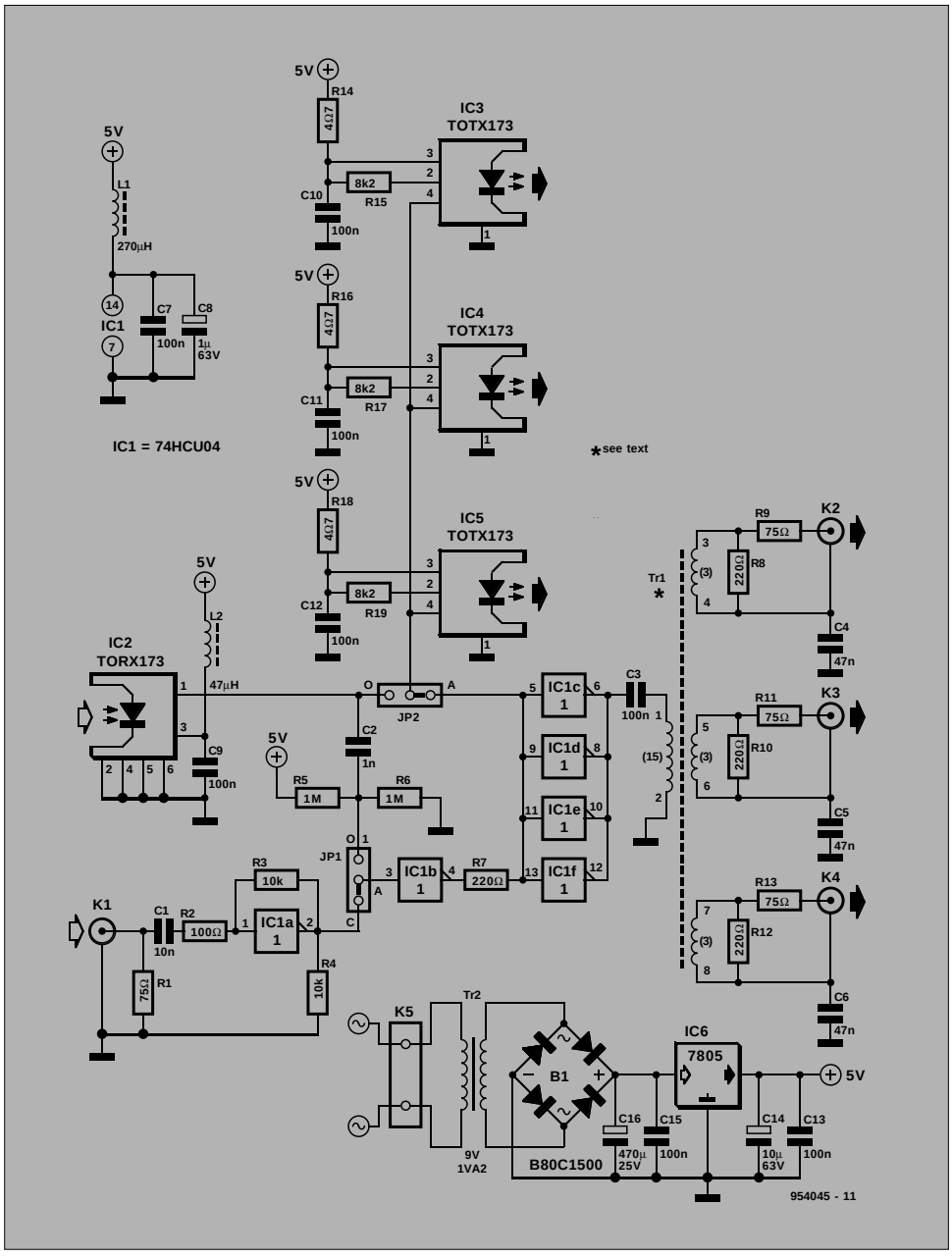
In the selections available, JP_1 has priority. The third option indicates that the circuit is capable of splitting two sources separately, while retaining their formats. It is not possible to make cross connections because it is not usually required to convert from coax to optical. The other way around, though, is far more usual, and available with the other three options.

The optical inputs and outputs consist of Toshiba 'Toslink' modules, which are TTL compatible. The coax inputs and outputs are formed by RCA-style 'phono' sockets. Both the Toslink modules and the phono sockets are accommodated on the printed circuit board.

A digital (coax) input signal is first amplified by IC_{1a}. Resistor R_4 lightly loads the gate to prevent it from oscillating if no input signal is connected. In some cases, a resistor with a slightly lower value may be required in this position. Next, jumper JP_1 allows the output of the amplifier (position 'C'), or that of Toslink receiver IC_2 (position 'O'), to be selected. The Toslink signal is superimposed on a half-supply bias created by R_5 and R_6, and then applied to IC_{1b}. The half-supply bias corresponds to the switching threshold of IC_{1b}. This allows Toslink transmitters IC_3, IC_4 and IC_5, to be driven from the output of receiver IC_2, or from the output of IC_{1b}. Remember, the signal supplied by the latter is cleaned and amplified. Simply select the option which gives the best results.

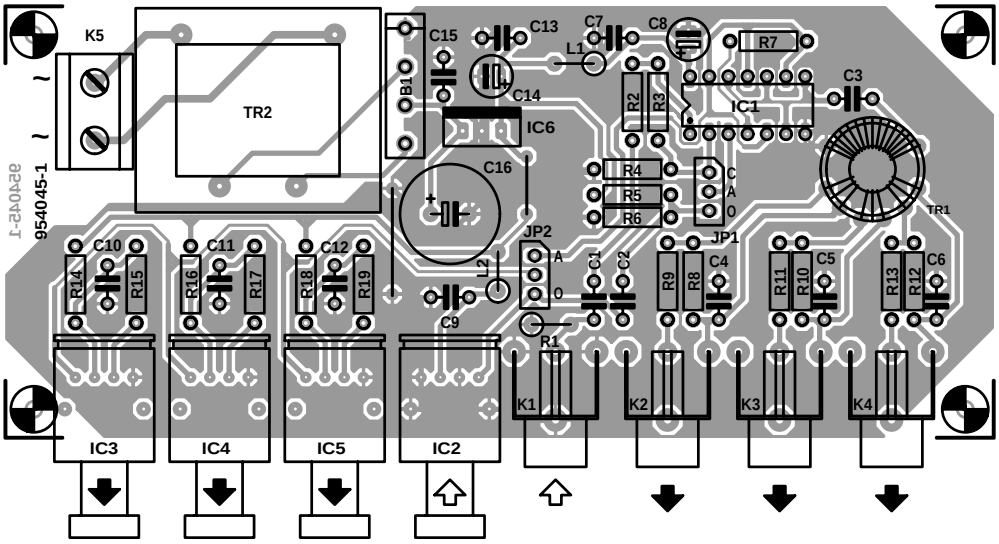
The buffer formed by the four parallel-connected inverters has sufficient drive capacity to match the low impedance of the primary of transformer Tr_1. The transformer actually forms the heart of the circuit. The three digital outputs are electrically isolated from the input, although the r.f. signals 'see' the ground level through capacitors C_4, C_5 and C_6. Matching resistors R_9, R_{11} and R_{13} prevent reflections at the relevant output from exceeding the ×1 level. Resistors R_8, R_{10} and R_{12} similarly damp the ringing effects which occur on the non-used secondary windings. The drawing shows the practical construction of the transformer, which is based on a type G2.3-FT12 ferrite ring core. This type was chosen because of its high bandwidth and coupling factor, factors which allow the primary winding of 15 turns to occupy only

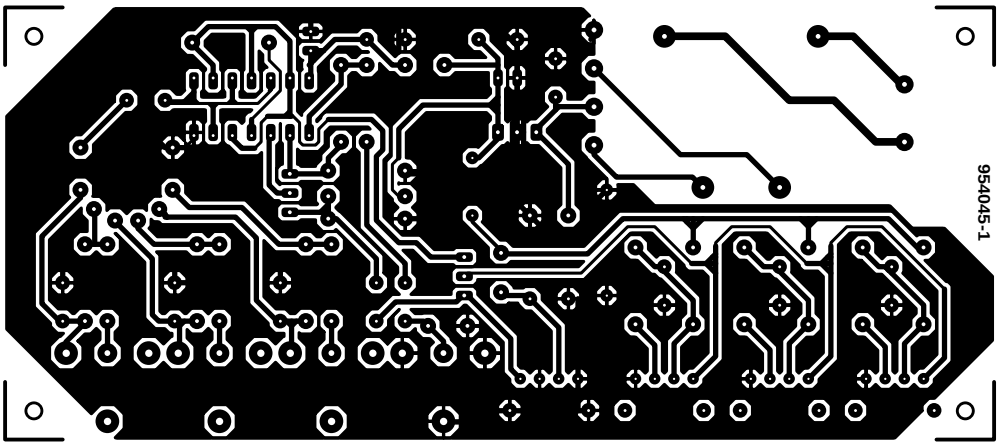




about half the core, while the secondary windings of three turns each are distributed over the remainder. All windings are made from 0.5-mm dia (24 SWG) enamelled copper wire.

The power supply is conventional and 'on board', consisting mainly of a 1.2-VA mains transformer, a bridge rectifier and a 7805 three-pin voltage regulator. All ICs on the board have individual supply decoupling parts. Current consumption of the circuit is of the order of 70 mA. We regret that the printed circuit board shown is not available ready-made.





Parts list

Resistors:
R_1;R_9;R_{11};R_{13} = 75Ω
R_2 = 100Ω
R_3;R_4 = 10kΩ
R_5;R_6 = 1MΩ
R_7;R_8;R_{10};R_{12} = 220Ω
R_{14};R_{16};R_{18} = 4Ω7
R_{15};R_{17};R_{19} = 8kΩ2

Capacitors:
C_1 = 10nF ceramic
C_2 = 1nF ceramic
C_3;C_7;C_9-C_{13};C_{15} = 100nF ceramic
C_4;C_5;C_6 = 47nF ceramic
C_8 = 1µF 63V radial
C_{14} = 10µF 63V radial
C_{16} = 470µF 25V radial

Inductors:
L_1 = 270µH choke
L_2 = 47µH choke

Semiconductors:
IC_1 = 74HCU04
IC_2 = TORX173 (Toshiba)
IC_3;IC_4;IC_5 = TOTX173 (Toshiba)
IC_6 = 7805

Miscellaneous:
JP_1;JP_2 = 3-way pin header, w. jumper.
K_1-K_4 = RCA style PCB mount socket, Monacor T709G.
K_5 = 2-way PCB terminal block, pitch 7.5mm.
B_1 = B80C1500
Tr_1 = G2.3-FT12 ferrite ring core; primary 15 turns 0.5mm dia. ecw, secondary 3×3 turns 0.5mm dia. ecw.
Tr_2 = 9V/1.2VA transformer, e.g, Hahn BV EI 302 0376; Velleman 1090012M; Monacor VTR1109 (1.5VA); Block VR1109 (1.5VA).

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