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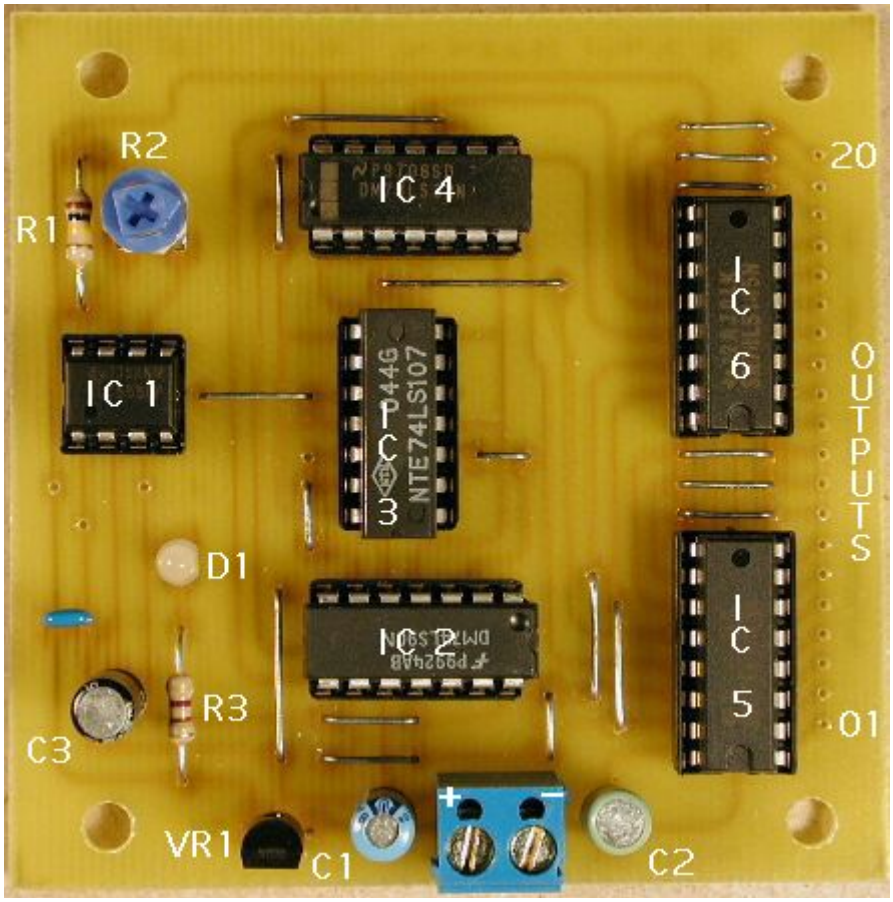
This page features a circuit that has twenty open collector outputs that turn on one at a time in a continuous sequential manner. The circuit make use of the 74LSxx family of TTL integrated logic devices. The circuits are designed to drive light emitting diodes or low current, low voltage incandescent lights but can also drive other loads of up to 80 milliamps.

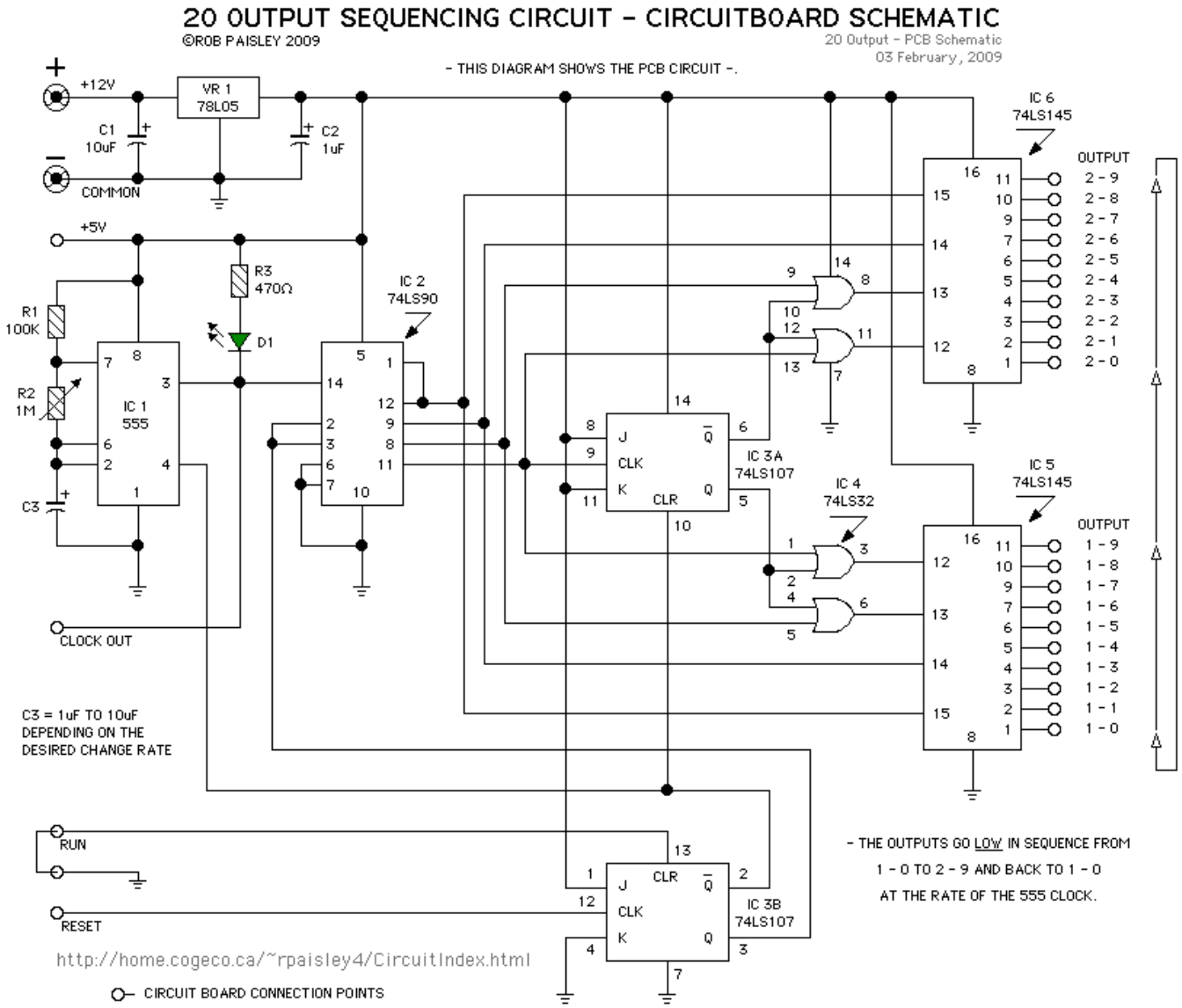
As logic circuits go, the 20 Step circuit is fairly simple but due to the high speed nature of the TTL Logic devices used, care must be taken when wiring these circuits. Simply put; The neater the wiring the better.

If you would like to make use of these circuits, please take the time to find and read at least the first 2 pages of the manufactures data sheets for the integrated circuits. Using Google, search for "74ls(part number)" in the first box and "PDF" in the second box on the advanced search page.



20 Output Sequencing Circuit

The following schematic is for the 20 Output Sequencing Circuit on the circuitboard shown above.



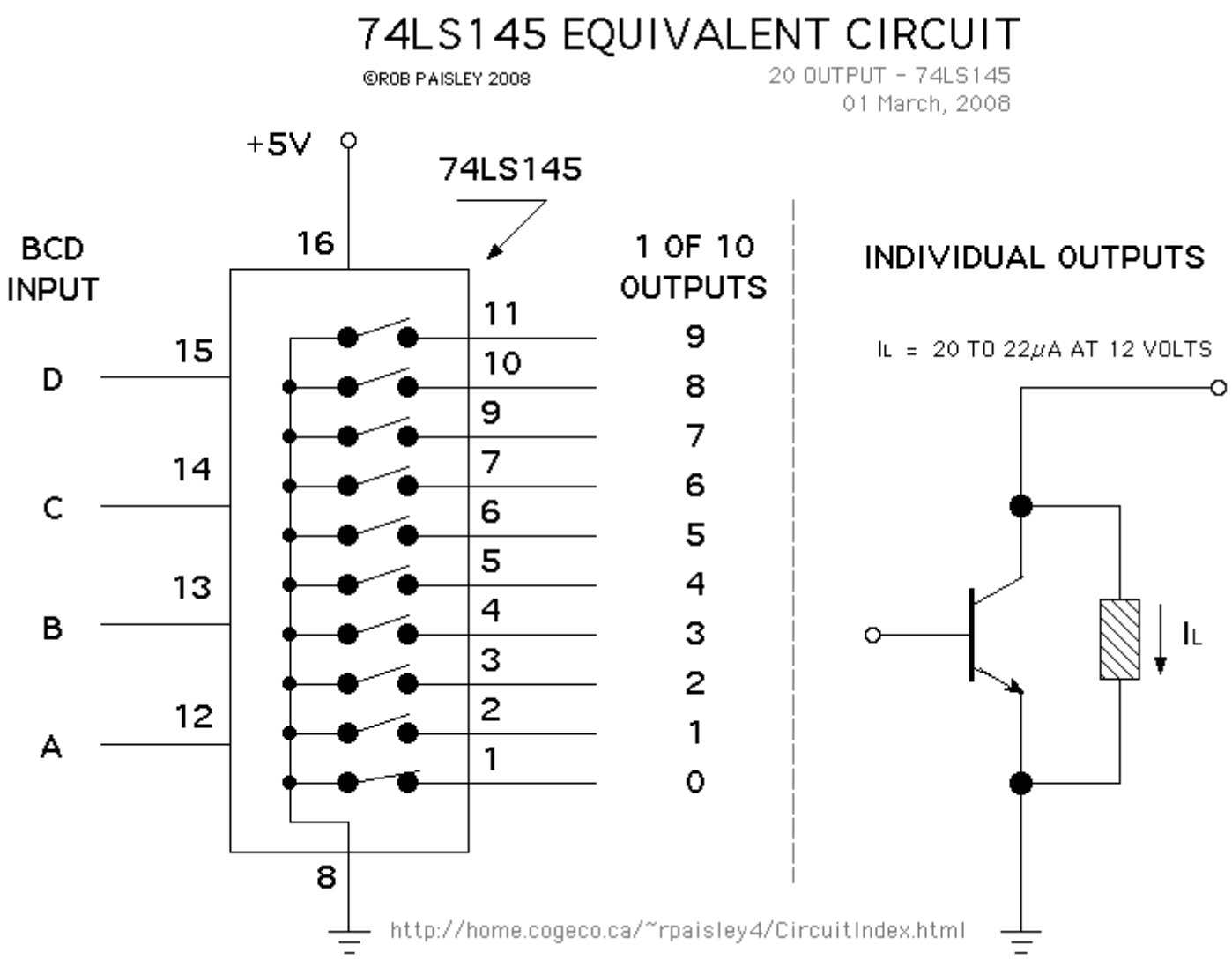
Basic Circuit Operation

- The circuit is stepped through the sequence by an adjustable LM555 astable oscillator.
- The Oscillators output is divided by a 74LS90 divider into a 10 step BCD weighted output.
- The BCD output then drives two 74LS145 - 1 of 10 decoders (See Notes) that are used to produce a 1 of 20 step output sequence.

Notes

- The circuit does not drive the 74LS145's directly but uses a 74LS107 JK Flip-Flop and four 74LS32 dual input OR gates to control to the inputs to the two 74LS145 output drivers. The 74LS107 and 74LS32 are used to create disallowed states in the output drivers alternately. The disallowed states prevent any of the ten outputs on that particular device from being turned ON while the other 74LS145 is in counting to ten.
- This produces a system where only one of the 74LS145's is able to produce a LOW output state at a time. In essence the circuit counts to 10 twice in succession rather than counting to 20 in a single cycle.
- This may seem like an unusual method but it allows the circuit to make economical use of the open collector outputs of the 74LS145s decoder/drivers rather using output buffer ICs driven by 74LS138 logic devices.
- The TTL logic devices in the circuit require a regulated 5 volt supply and draw approximately 60 miliamps. The outputs of the 74LS145's can be supplied from up to 15 Volts with a maximum current of 80 milliamps.
- The circuit above is shown in a continuous running mode. The circuit can also be externally stopped and reset as shown in later diagrams.

74LS145 Equivalent Output Circuit



Parts List

The following is a parts list for use with the 20 Output Sequencing Circuit. Mouser Electronics part numbers are shown but the parts may be available from other sources as well. Suppliers that handle 'NTE' components should be able to get the ICs.

Part Number		Mouser Description		Mouser Part #		QTY
VR 1	-	Voltage Regulators TO-92 5.0V 0.1A	-	511-L78L05ABZ	-	1
IC 1	-	Timers DIP-8 Single Timer	-	512-LM555CN	-	1
IC 2	-	DECADE COUNTER DIP14	-	526-NTE74LS90	-	1
IC 3	-	DUAL J-K F/F DIP-14	-	526-NTE74LS107	-	1
IC 4	-	QUAD 2-IN OR DIP-14	-	526-NTE74LS32	-	1
IC 5, 6	-	BCD-DEC DECODER DP16	-	595-SN74LS145N	-	2
R1	-	100K ohm / 1/4 Watt Carbon Resistor	-	660-CF1/4C104J	-	1
R2	-	Trimmer Potentiometers 1Mohms 6mm	-	531-PT6KV-1M	-	1
R3	-	470 ohm / 1/4 Watt Carbon Resistor	-	660-CF1/4C471J	-	1
C1, C3	-	Radial Electrolytic Capacitors 25V 10uF	-	140-XRL25V10	-	2
C2	-	Radial Electrolytic Capacitors 25V 1.0uF	-	140-XRL25V1.0	-	1
D1	-	Green 3mm LED	-	859-LTL-4231	-	1
-	-	2 Position Terminal Block - 5mm				

The 1N4148 diodes for the traffic signals shown below are Mouser part number 78-1N4148.