Circuit description of the 1-pty revertive ring trunk

Designed and implemented by Rick Walsh

The 4 relays - A,B,F, and G are normally all released. The drawing convention of the relay contacts is as follows - the "X" on a line of the schematic is a normally open contact. The vertical line is a normally closed contact. An X and a vertical line near each other is a transfer set (single pole, double throw).

When a phone goes off hook, a line finder locates the line and extends it to a first selector. The trunk is accessed from an assigned selector level - let's say level 7. So the caller dials a "7" and the wipers step in to the first trunk on the 7th level and the call is extended through bank contacts at "71" to "my" trunk. The calling phone closes a loop across the Tip and Ring in to the trunk. This loop closes a path that originates from the -48v on one winding of the A relay through the unoperated contacts of the G relay (1 and 2) out through the selector and linefinder out to and through the telephone set and then back through the linefinder and selector and the other contacts of the G relay (4 and 5) to the other winding of the G relay to ground. This current flow causes the A relay to operate. A operated causes relay B to operate through the 2,3 contacts of A. B operated grounds the S (sleeve) lead toward the selector to hold the preceding switches (the selector and the linefinder operated). B operated also grounds the MS (motor start) lead to cause the ringing machines to operate.

The calling party now hangs up. This causes the A relay to release, but the B relay is slow to release. A path for ground now extends from the 1,2 contacts of A, through the 7,8 contacts of B through the 3,4 contacts of F to the G relay coil and then to -48v battery. The G relay operated closes its 7,8 contacts to energize the B relay. The G relay operated also transfers the Tip/ Ring loop from the A relay coil to the ring ground lead (N) and the Ring voltage lead (M). Note that the ring current also flows through one winding of the F relay. This winding of the F relay is special - it only operates F when DC current is flowing through but ignores the AC ring voltage. The ring voltage extends to the calling telephone (now on-hook) causing the bell to ring.

When the calling party answers the phone a DC path now exists through the telephone and the F relay winding senses this and operates. Instantly, the F relay contacts 1,2 close causing F to lock operated via the ground coming from the operated B relay contacts (4,5).

F operated opens the 3,4 contacts of F opening the path for the G relay coil. G released allows the loop to now operate the A relay again (G released also causing ring voltage to be removed from the line). With A reoperated B will remain operated as the G (7,8) path is opened. The calling party will then hang up, but this time G will not reoperate as the path to the G relay coil is open by the operated F 3,4 contacts (which will be open). Thus the ring-back sequence will not be re-initiated as the party hangs up. Upon hang up the A and B relays release and so does the F relay - returning everything back to the idle state.

The ring voltage supplied to this trunk is interrupted and has -48vdc superimposed. During the silent period a -48vdc is supplied from the ringing circuits and during ringing periods the 86vac (@20Hz) ring voltage has -48vdc "underneath". This is of course to trip ringing (via the F relay) during ring or silence periods.

The relays used in my design are from a Western Electric ED-65721-01 PBX selector-connector. Any CO or PBX connector switch should have appropriate relays. The specific relays I used are: A = 221 ND, B = 248 F, F = 221 LD, G = 221 EE

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