Installing *Rotatone*
Pulse Dial to Tone Dial Conversion Module

What's in the Rotatone module and general connection principles

The Rotatone is based on an 8-bit microprocessor running at a maximum of 8 Mhz. All functionality, including the pulse decoding, timing, menu selection, number storage and DTMF tone generation is implemented in firmware, enabling a very small and compact hardware unit.

The module has five connecting leads. Two of these leads connect to the phone circuit, and 3 of the leads connect to the dial. The dial is otherwise not connected to the phone circuit.

The leads are:

1. Orange/Red. Positive supply and signal line.
2. Blue. Negative supply and signal line.
3. Pink (White on some units) Common connection to dial.
4. Orange. Connection to pulse contact on dial.
5. Brown. Connection to shunt contact on dial.

For a Northern Electric or Western Electric 4H or 5H, the Pink (White) wire from Rotatone would connect to BK terminal, the Orange wire to Y terminal, and the Brown wire to R terminal.

In order for the module to operate, it needs a source of power from the telephone line, and the ability to insert the tone signals onto the line. It does this with just 2 wires, the Orange/Red and the Blue (positive and negative). It inserts the tone onto the line by modulating its current consumption, which generates the signal voltage across the line impedance.

In the simplest installation, the Orange/Red and Blue wires are connected straight across the line AFTER (phone side) of the hook switch. Note that Rotatone IS polarity sensitive (see section 'Dealing with polarity issues'), the Orange/Red wire must be connected to the most positive line (Green or tip for North America, White or Line A for UK) and the blue to the most negative (red or ring for North America, red or line B for UK). When the phone is off-hook, Rotatone then has access to the line to insert the DTMF tones and a source of power from the line.

Rotatone needs about 5 volts minimum across the Orange/Red and Blue wires in order to operate correctly and reliably. If the phone is fitted with an electronic transmitter, this level of voltage will be present in all circumstances of line current, as the electronics of the transmitter unit will insert a resistance into the line in order to obtain this level of voltage for the operation of its own electronic circuits. If a carbon microphone is fitted, it is possible that the low transmitter resistance may cause the voltage to fall below the 5 volt Rotatone minimum. A simple solution to this potential problem is to either fit the phone with an electronic transmitter, or to install a 5.1 volt Zener diode anywhere in the telephone series circuit (with due consideration given to polarity.) Invariably the easiest place to put the 5.1 volt Zener diode is between the wires that were previously connected to the pulsing contacts on the dial..

Voltages up to 35 volts are acceptable, as the module is fitted with its own voltage regulator. Voltages however must not exceed 40 volts, so do not connect the unit on the exchange side of the hook switch where it would be exposed to ringing voltages (it would cause the line to go 'off hook' but this can't be relied on to protect the circuit). For additional surge protection, a 24v Zener diode can be installed across the line after the switchook as shown in the generic diagrams below.

The connections from Rotatone to the dial accomplish 2 things. Firstly, the number being dialled is signalled to Rotatone by breaking and making the contact between the Orange and Pink(White) wires in quick succession corresponding to the number being dialled (the dial should connect these together when the dial is not being used). A standard Rotatone is programmed for 1 disconnect sending a DTMF '1', 10 for DTMF '0' as is almost universally standard. However special versions can be supplied for other dial markings, for example New Zealand and Norway.

The second signal sent by the dial to Rotatone uses the transmitter shunt contact on the dial to indicate that the dial is not in its resting position. This is achieved by connecting the Pink (White) and Brown wires of Rotatone together. In this way Rotatone can detect when a number is being dialed and held against the finger stop.

The current flowing through the dial contacts when connected to Rotatone circuit is very small compared to normal use. This is good news from a contact life point of view, but does mean that when Rotatone is installed the dial contacts should be thoroughly cleaned and checked to avoid false signals caused by dirt or corrosion.

Simplified Phone Circuit - Before Conversion

Simplified Phone Circuit - After Conversion
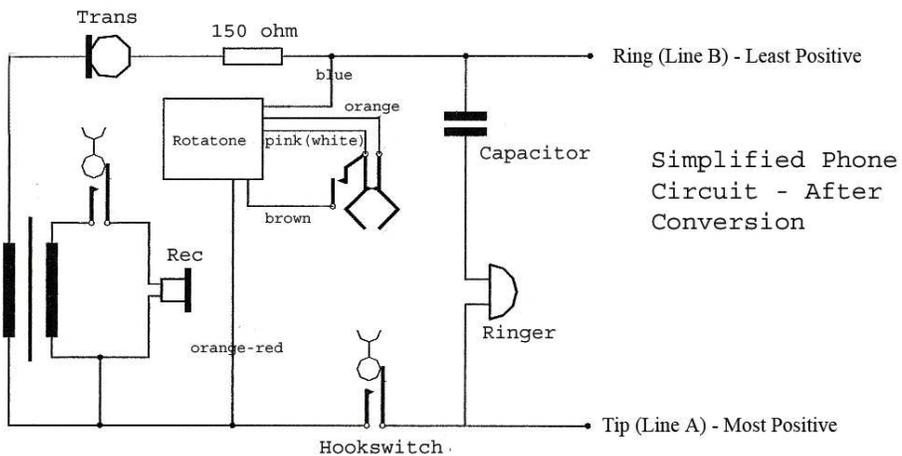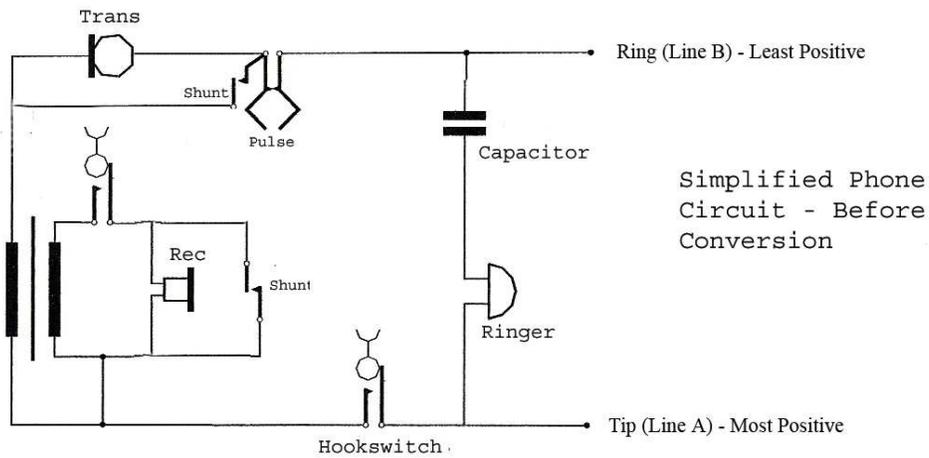
The above two diagrams above show a simple phone with a 'before and after' circuit. In order to operate Rotatone, the dial must have normally closed pulse contacts, and a contact that shorts to one of the pulse contacts when the dial is not at rest. There a relatively few dials that are not compatible with Rotatone.

After Rotatone is installed, neither the microphone nor the receiver requires shunting during dialling. In fact, a shunt would be undesirable because Rotatone reproduces a faint clicking during dialling that mimics the sound a conventional loop disconnect phone makes during dialling.

Dealing with polarity issues

When Rotatone was being developed, a decision was made not to incorporate a polarity correction circuit within Rotatone module. This decision was made for a number of reasons, the chief of which is that the polarity protection was best applied to the entire phone, and not just to the Rotatone module. In addition, by keeping the polarity guard as a separate module, the installer will have maximum installation flexibility.

In its simplest installation, Rotatone requires proper telephone line polarity in order to operate. If a Rotatone equipped telephone is being installed where the polarity is known to be correct, then a polarity guard (bridge rectifier) will not be required. If however Rotatone is being installed in a telephone that is being sold or placed in an unknown location, the installer is strongly advised to incorporate polarity protection in the installation.

It is very easy to incorporate polarity protection during the installation. Simply install a small bridge rectifier (say 1A 600v like Farnell 407-7300), or a standard telephone polarity guard on the incoming telephone line AFTER the hookswitch. The polarized lines from the polarity guard should be connected to the telephone circuit so that the positive lead connects to the Orange-Red lead from Rotatone, and the negative lead connects to the blue lead from the Rotatone. With the 5.1v Zener diode installed in the circuit, the Orange/Red and Blue leads of Rotatone will have at least 5 volts available.
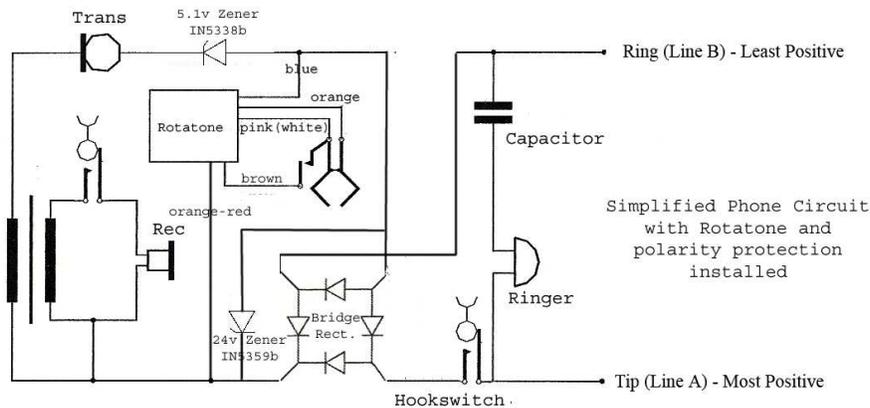
The above diagram shows the use of a bridge rectifier in order to make Rotatone polarity independent.

Specials Feature for Rotatone SMD – V2

If you are using a Rotatone SMD V2, you have access to a few additional features. The Rotatone SMD V2 looks like the following photo. (Note – check for the V2 sticker)
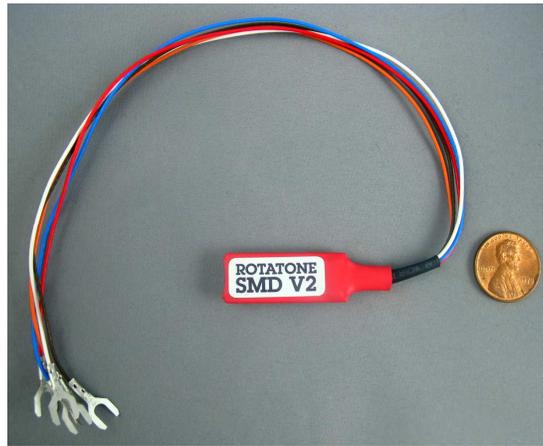
Programming Hotdial Delay, Tone length and dial mapping (SMD-V2 Only)

The hotdial number, hotdial delay, DTMF tone length and the dial mapping can be programmed by the user from this version on. Both are selected from level two menu behind '3': (ie – dial 3, wait for two beeps, and then dial the appropriate four digits outlined below.)

First digit	position of hotdial number in autodial directory
Second digit	hotdial delay
Third digit	DTMF tone length
Fourth digit	Dial Mapping.

For Hotdial Location   Enter location of stored number (4,5,6,7,8,9 or 0, or ,1,2,3 if no hotdial number is required)

For Hotdial Delay   0 is 5 seconds
1 is ½ second
2 is 1 second
3 is 1.5 seconds
4 is 2 seconds
5 is 2.5 seconds
6 is 3 seconds
7 is 3.5 seconds
8 is 4 seconds
9 is 4.5 seconds

For DTMF tone length: 0 is 60ms (as shipped)
1 is 80ms
2 is 100ms
3 is 120ms
4 is 140ms
5 is 160ms
6 is 180ms
7 is 200ms
8 is 220ms
9 is 240ms

For Dial Mapping: 0 is standard mapping 1,2,3,4,5,6,7,8,9,0
9 is leading 0 mapping 0,1,2,3,4,5,6,7,8,9
8 is reverse mapping 9,8,7,6,5,4,3,2,1,0
7 is leading 0 reverse mapping 0,9,8,7,6,5,4,3,2,1
6,5,4,3,2,1 not allocated