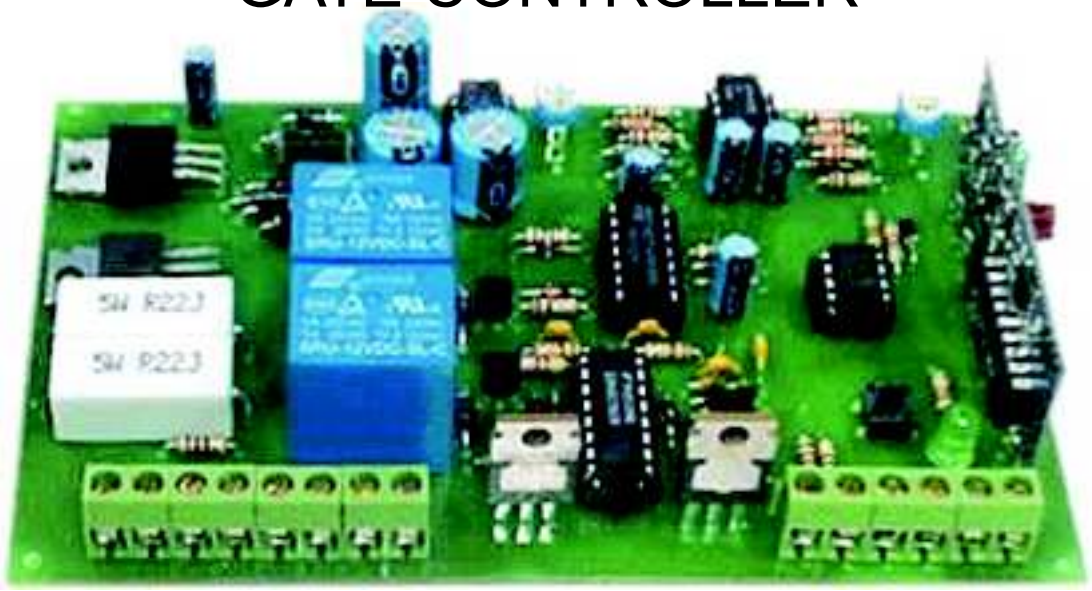
K023C REMOTE CONTROL GARAGE DOOR / GATE CONTROLLER

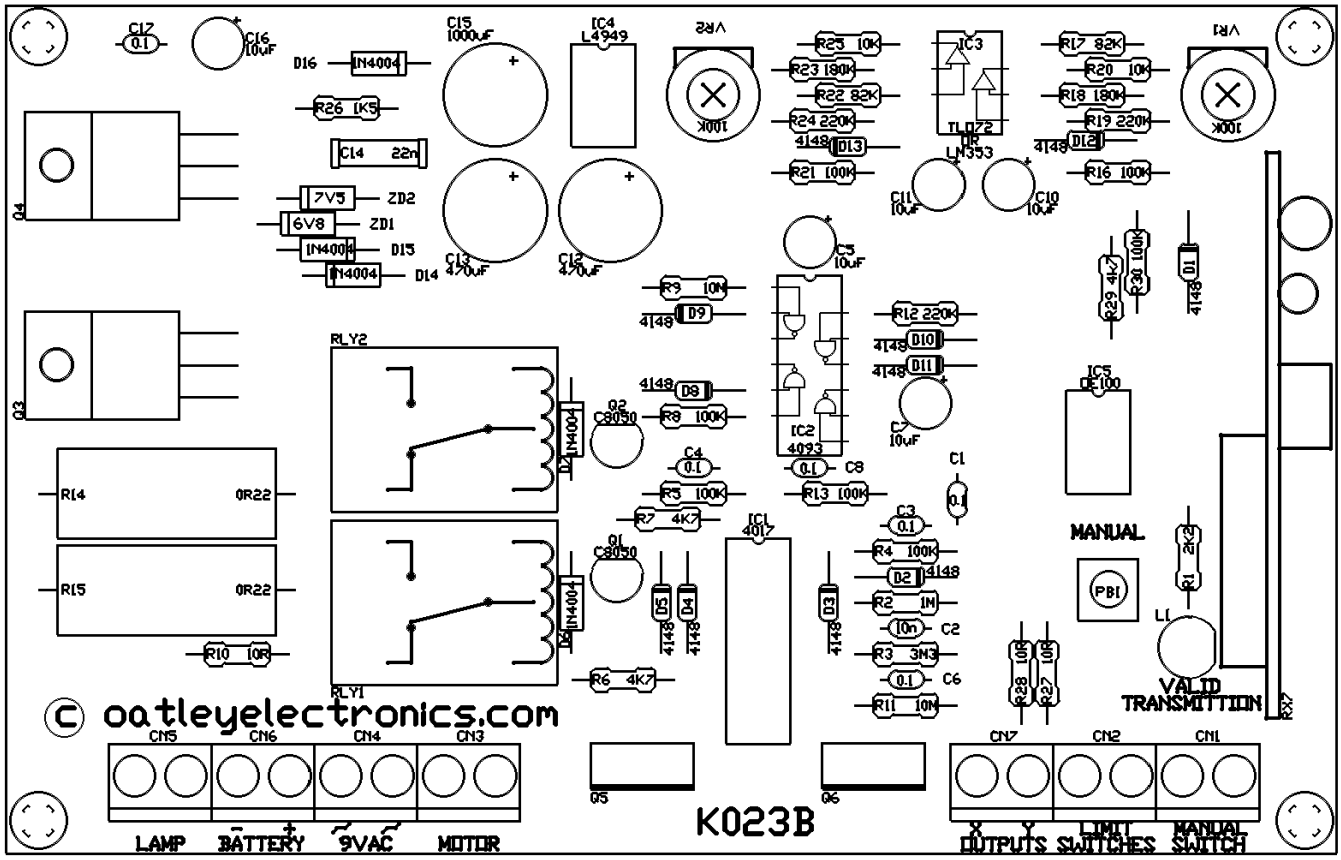


This kit is a redesign of our popular garage remote kit (K023B). It contains all the required electronics for remote control at 433MHz (UHF) of DC motors that operate garage doors, gates, and shutters. Motor and mechanical parts are not supplied. Features include 12VDC output for door / gate drive motor, over half a million possible security codes, motor over-current sensing that will cause the motor to stop if the door hits an obstruction, provision for upper and lower limit switches, timed output for operating a 12V courtesy light and a built-in battery charger. Some of the new features include optional parts (order with kit extension) for 2 MOSFET (latching or momentary) outputs to drive other devices such alarms & driveway lights etc. independent of the door / gate operation. This kit is now based on our pre-built and pre-tuned CODE HOPPING 433MHz UHF receiver module RX9.

This UHF remote control uses an assembled transmitter and an assembled UHF receiver front-end that makes construction easier our previous UHF remote control kit. The main features of the circuit are provision for upper and lower door travel limit switches and over-current sensing for UP and DOWN modes of operation. This latter feature can be used to detect obstructions and immediately stop door operation to prevent damage to the motor, drive mechanism or possibly even your car. The unit is based on a pre-built UHF receiver module and features a small keyfob transmitter that has more than half a million possible codes. You press the button on the transmitter and the door goes up; press the same button again and the door goes down. The circuit has provision for a manual switch which can be mounted somewhere on the wall inside the garage. This works in a similar way to the button on the transmitter: press it once for the door to go up and press it again to make the door go down. If you press the button before the door reaches the end of its travel, it will stop. You then have to press the button again to make the door go in the opposite direction. This applies also to operation via the transmitter.

Circuit Description of Receiver

The receiver is based on a pre-built "front-end" module. This processes the received signal and raises to 5V the output corresponding to the button pressed. The door operation can be set to work with button "A" or "B", this is selected by making connections at point "A" or "B" under the PCB, the connection marked "VT" can also be used but the door will operate with any button on the transmitter. This connection can be made with a blob of solder shorting the selected pads together. The main IC on the receiver module is a tristate decoder chip which includes an internal oscillator that matches the oscillator frequency of 100KHz used in the transmitter. The IC is used to decode the pulse signal that's generated by the transmitter. This device has 8 address lines and these must be connected to match the transmitter code. (for more see coding section of this text). If the code sequence IC matches its address lines,, the valid transmission output switches high and L1 is lit. This output connects via diode D1 to the clock input (pin14) of IC1, a 4017 decade counter. This counter can also be clocked by manual switch PB1 and by limit switches. The length of the clock pulses produced by the operation of the limit switches is limited by the time constant of the associated 0.1uF capacitor and 3.3MW resistor. The 0.01uF capacitor filters out any noise picked up by the wires used to connect to the switches, while the 10M resistor discharges the 0.1uF capacitor after the switches have been operated. Note that when the power is first applied, IC1 is reset by a short pulse on the reset line, by virtue of the 0.1uF capacitor connected to the +5V supply line. The counter is also reset when its Q4 output goes high; a pulse is applied to the reset input via diode D3. This means that IC4 can only have four exclusive output states: Q0 high, Q1 high, Q2 high or Q3 high. Outputs Q0 and Q2 do not drive anything so they correspond to "stop" modes while outputs Q1 and Q3 switch the "up" and "down" relays (via transistors Q1 and Q2).



Thus, a succession of clock pulses from the receiver correspond to the following modes: Stop, Up, Stop, Down, Stop, Up, etc. Two separate over-current detectors, comprising op amp comparators IC3a and IC3b, detect higher than normal motor currents that would result when the door reaches its up or down stop positions or if the door is obstructed. The outputs of these over-current detectors then apply a pulse to the clock input of IC1, which causes it to go into the Stop mode. The counter can be disabled from clocking by its ENA-bar input being held at "0". The output of the monostable comprising Schmitt NAND gates IC3a & IC3b is normally high, thus enabling the counter to clock. However, this monostable is triggered via isolating diodes D4 & D5 each time Q1 (up) or Q3 (down) of IC2 first go high. This monostable therefore prevents the counter from stepping for approximately two seconds after the up or down modes are first activated. This two-second disabling of the counter prevents it being triggered by the overcurrent detectors, which would otherwise happen since a motor draws relatively high currents when it first starts up. A second monostable made up of gates IC2a & IC2b is used to switch a lamp via mosfet Q3. This monostable is also operated via diodes D4 & D5 each time Q1 (up) or Q3 (down) of IC2 goes high. The time constant of the monastable causes the courtesy lamp to light for just under two minutes. A combination of a 12V battery and 9V / 2.2A AC plugpack are used to power the controller and charge the battery via the TIP41 and associated zener diodes. The battery is charged at around 150mA and lessens with increased battery voltage. A L4949 regulator IC provides +5V supply for the receiver, while the relays and motor are driven directly from the 12V battery.

AUX. OUTPUTS

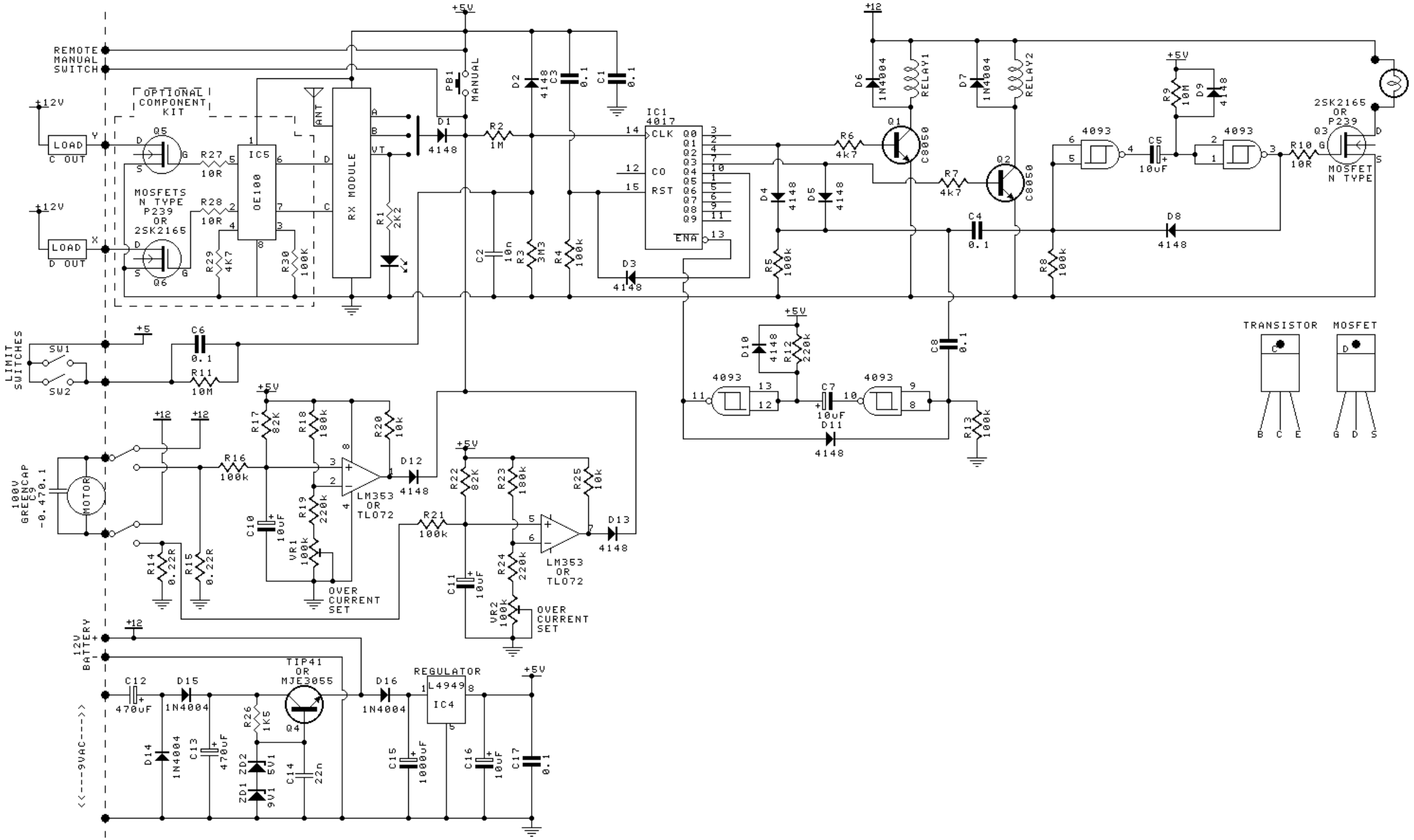
Outputs "X" & "Y" are outputs to drive other devices like alarms etc. each of these outputs provide GND (of the 12V rail) Via a MOSFET and are triggered by the spare "C" or "D" buttons on the transmitter. The OE100 IC is a pre-programmed PIC micro and drives the X & Y MOSFET Aux. outputs. one button press less than 0.5 sec. gives momentary output. one button press more than 0.5 sec. gives latching output. any button press more than 1 sec. gives momentary output.

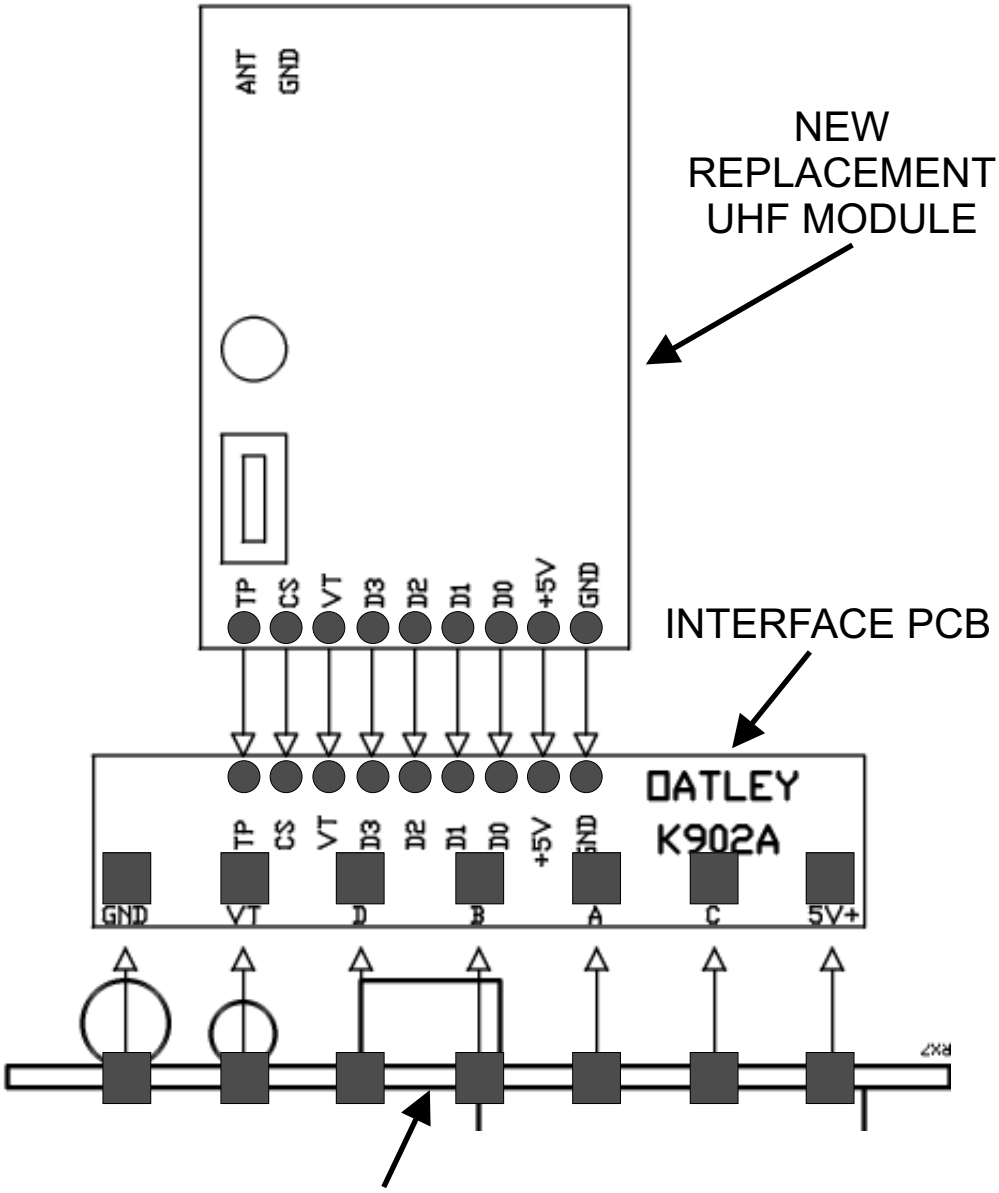
Construction and operation

First install the wire links on PCB as shown by the white lines. Then install all of the parts as shown on the PCB overlay, leaving the receiver module till last. The antenna for this kit is connected directly to the UHF Receiver Module supplied.

CODING

The transmitter and receiver come with their encoder ICs unencoded. After the system is operating correctly, you may code the transmitter and receiver. Data inputs are pins 1 through to 8 on both the encoder IC in the TX unit and decoder IC on the receiver module . Data coding inputs are tri-state, i.e. each data pin may be either left floating, tied to "1" or tied to "0". Ensure that the coding state on each pin number on the encoder IC is wired with the same coding state as the corresponding pin on the decoder IC, otherwise the remote control will not operate. These connections can also be made with a solder blob between the IC pins and their nearby exposed 0V or +5V tracks. Note that the over-current setting trimpots (VR1 & VR2) are set during installation of the door mechanism.


REMOTE
MANUAL
SWITCH
OPTIONAL
COMPONENT
KIT
+12V
LOAD
C OUT
LOAD
D OUT
Q5
Q6
MOSFETS
N TYPE
P239
OR
2SK2165
R27
10R
R28
10R
R29
4K7
R30
100K
IC5
OE100
ANT
RX MODULE
R1
2K2
PB1
MANUAL
D1
4148
R2
1M
D2
4148
C3
0.1
C1
0.1
IC1
4017
CLK
CO
RST
ENA
C2
10n
R3
3M3
R4
100k
D3
4148
D4
4148
D5
4148
R5
100k
D6
1N4004
RELAY1
D7
1N4004
RELAY2
Q1
C8050
Q2
C8050
R6
4k7
R7
4k7
C4
0.1
R8
100k
D8
4148
4093
C5
10uF
R9
10M
D9
4148
R10
10R
2SK2165
OR
P239
Q3
MOSFET
N TYPE
TRANSISTOR
MOSFET
B C E
G D S
LIMIT
SWITCHES
SW1
SW2
C6
0.1
R11
10M
100V
GREENCAP
C9
-0.470.1
MOTOR
R16
100k
R17
82K
R18
180k
R19
220k
VR1
100k
R20
10k
LM353
OR
TL072
D12
4148
C10
10uF
OVER
CURRENT
SET
R14
0.22R
R15
0.22R
R21
100k
R22
82K
R23
180k
R24
220k
VR2
100k
R25
10k
D13
4148
C11
10uF
12V
BATTERY
C12
470uF
D15
1N4004
D14
1N4004
C13
470uF
TIP41
OR
MJE3055
Q4
R26
1K5
ZD2
5V1
ZD1
9V1
C14
22n
D16
1N4004
REGULATOR
L4949
IC4
C15
1000uF
C16
10uF
C17
0.1
<<---9VAC--->>
D10
4148
R12
220k
C7
10uF
D11
4148
R13
100k
C8
0.1



THE FOOTPRINT OF THE RX7 MODULE TO BE REPLACED IS PRINTED ON THE PCB AS SHOWN.

Place the pins of the new uhf module into the holes of the k902a interface pcb as shown then solder in place.

The interface pcb can be connected as per the rx7 module with some leftover component leads.

Programming RX9s to work with a single or multiple TX9s.

(1) Connect power to the RX9 or the kit the RX9 is connected to.

(2) Hold the button on the RX9 until the "Valid Transmission" LED lights continuously.

(3) Press and release button "A" on the TX9.

(4) Test operation by pressing the buttons on the TX9. The "Valid Transmission LED should light.

(5) Repeat steps 2 - 4 to add more TX9s (up to 100 TX9s can be added).

Removing <u>ALL</u> TX9s form the RX9's memory.

(1) Hold the button on the RX9 until the "Valid Transmission" LED flashes.

(2) Test operation by pressing the buttons on the TX9. The "Valid Transmission LED should not light.