

# MIZUHO Rose-Kit series

1W CW QRP

7 / 21 MHz Transmitter Kit

MODEL **QP-7**  
**QP-21**

¥3,000

ASSEMBLY MANUAL

## Easy Construction

Building your own transmitter is exciting and much more satisfying than using commercially-made "luxury" units.

In the days of many high-power stations, 1W QRP is a lot of fun! QP-7 is a mini-transmitter, made by Mizuho for your enjoyment. It is a CW transmitter, but you can convert it to AM easily, by adding a modulator.

This kit contains all necessary parts and the PCB. It is called the "BARA" kit, which stands for "rose" in Japanese.

## Circuit

The transmitter contains 3 stages (see block diagram in fig. 1 and schematics in fig. 2):

### 1. Crystal Oscillator

A 7 MHz crystal oscillates in a Pierce-type oscillator circuit.

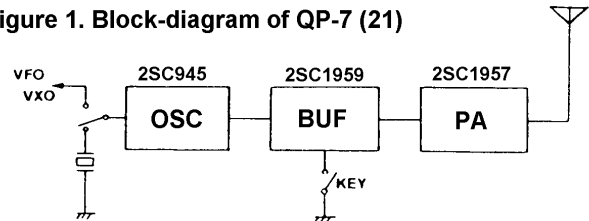
### 2. Buffer/Amplifier

This stage isolates the oscillator from the power amplifier and the antenna.

### 3. Power Amplifier

This stage amplifies the signal from the oscillator to a higher level. Output is around one (1) watt. A 5-element low-pass harmonic filter on the collector of the final transistor attenuates undesirable harmonics and assures proper matching to the antenna load. The final transistor is a 2SC1957.

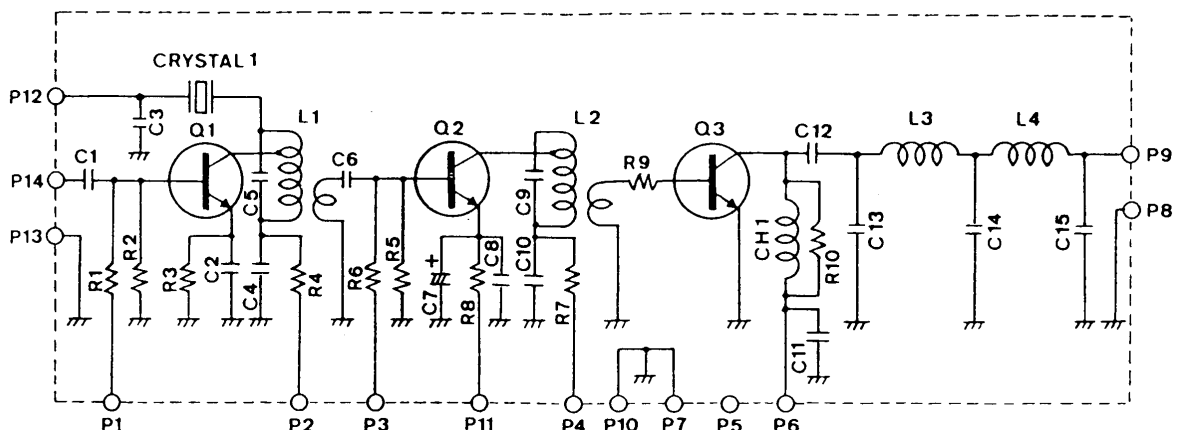
Figure 1. Block-diagram of QP-7 (21)



## Construction

First inventory all parts and make sure none is missing. You will also find some small pins. Those are soldered on the boards as terminals (see fig. 3 for pin placement). When you assemble the kit, make sure the transistors are oriented correctly, as described in fig. 4. Resistors are identified by their color code (fig. 5). You can simplify the assembly job by pre-sorting the resistors and tacking them on a copy of the parts list. Capacitors have their values printed on them. For an example, a 0.01uF capacitor reads 103, which means  $10 \times 10^{**3}$  or 10,000 pF. For caps smaller than 100pF, the actual value may be shown instead of the coded value above. The final transistor Q3 must have a heat sink. It is tightened to the board with a 3x10 screw, which is supplied with the kit (see fig. 6). You should be able to complete the kit assembly within 2 hours.

Figure 2. Schematic Diagram  
MIZUHO QP-7(21)



After you are done, place and solder the pins on the PCB. You may connect an ammeter to measure the supply current as shown in fig. 7. Without an ammeter, you must wire the pins, as shown in the dotted line in fig. 7. The transmitter will not function correctly, if you fail to wire the pins!

Figure 3. How to use pin

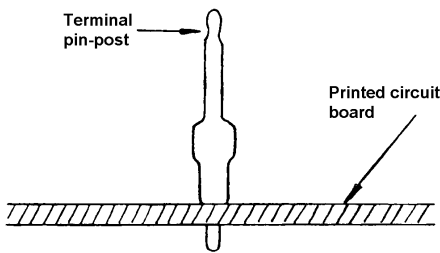
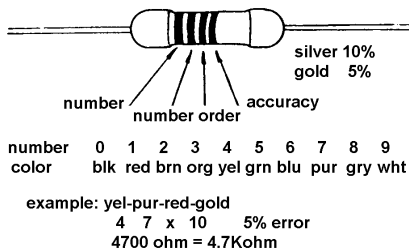


Figure 5. Resistor color code



## 2. Alignment of the Buffer stage

Connect the RF-probe between the collector of Q2 (or the base of Q3) and ground. Adjust L2 for peak readout.

## 3. Alignment of the Final amplifier stage

Connect the RF-probe across the antenna terminals. Adjust L3 and L4 for maximum output. Alternatively, you may use an LED with a single coil at L4, as shown in fig. 9. Adjust L3 and L4 for maximum brightness.

Figure 4. Transistor pin assign

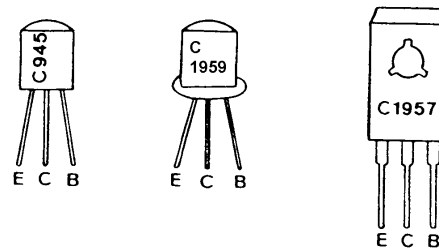
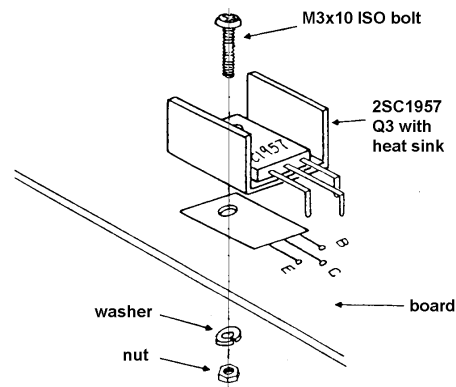


Figure 6. Heat sink install



## Alignment

To perform the alignment procedure, you need an RF-meter. Alternatively you can use a home-built RF-probe (see fig. 8), attached to a DC voltmeter. Set the voltmeter to the lowest range during these measurements. We recommend that you use an insulated tool for adjusting L1 and L2. Connect a 50 ohm / 2W load (51 ohm resistor is OK) across the antenna terminals. apply power and key-down the transmitter. It is best to monitor the supply current while you first apply power. Any excessive current is an indication of a problem in the construction.

### 1. Alignment of the Oscillator stage

Connect the RF-probe between the collector of Q1 and ground. Adjust L1 for maximum signal readout.

### 4. Now tweak L1 and L2 again for maximum output.

You have just completed the alignment of your transmitter! Key-down and monitor the signal on a good receiver. You will still detect a carrier tone with key up, since Q1 oscillator is free-running. This is not a problem during a QSO.

Note : Combine L4 and LED with one-turn coil. And adjust L3, L4 cores as LED will light brightly. After that, adjust through L1 to L4 as LED to be brightest

Note : Prepare the current meter for DC. If you will not use the meter, connect each terminals as per dotted lines (short-circuit). Accordingly, 0.01uF condenser will be not necessary.

Note: keep wiring short (1.0-1.5"). The RF-probe wiring may be longer, provided the rectifier circuit

(fig. 8) is very close to the actual circuit.

Figure 8. Simple RF-probe

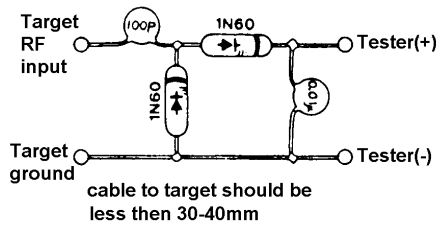


Figure 9. Filter alignment

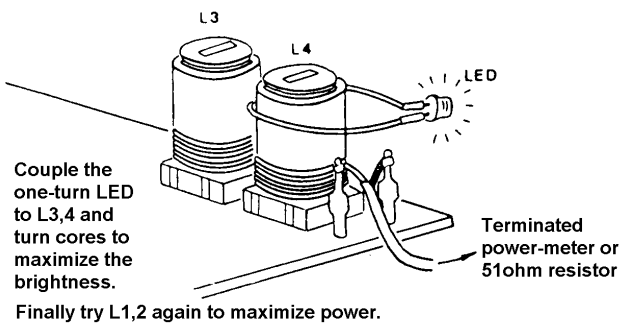
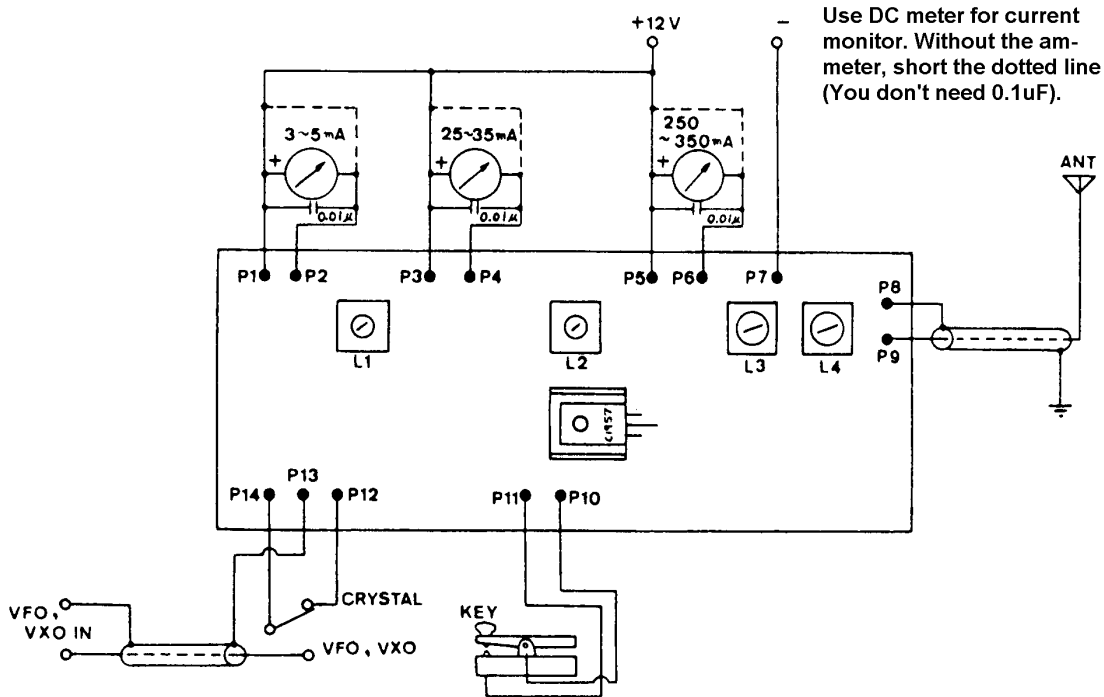


Figure 7. Board pin connection



### Attaching a receiver

You will need a "Standby Switch" for switching the

power supply to the transmitter and the antenna, when using this transmitter in combination with a receiver. a DPDT (double-pole double-throw) switch, which is a two-circuit dual position switch will do the job (see fig. 10 for details). You may need to use a more complicated scheme to activate the transmit, while the receiver is on (for zero-beating). Fig. 11 shows the transmitter, as it used with a commercial receiver. Use the MUTE capability of a communications receiver when transmitting. If you are using a transceiver for reception, you may have to use the PTT to mute its receiver. For a tube-type transceiver, just turn off the heater to the final stage. Some solid-state radios allow turning down power to zero. You may also set your transceiver is a "split" mode, with transmit out-of-band. Check with your owner's manual, to make sure the transceiver will mute in this configuration, when PTT is applied. If you use a short wave receiver, you may have to turn off the external power while transmitting, as shown in fig. 12.

### Other Applications

Enthusiasts of AM-phone may add a modulator to this transmitter, as shown in fig. 13. Modulating this 1W transmitter is a "light" task, and can be applied

at the collector of the final transistor Q3. You can also apply modulation to the buffer/amp stage. The lower level signal may be obtained from a tap in the modulation transformer. Nowadays, you may think there aren't many AM stations on the 7 or 21 MHz

bands. You may still communicate with your AM-phone transmitter, and if anybody complains about "too much carrier old man", you may answer "not really, it's an AM-phone transmitter" and enjoy the surprise of the other operator mumbling something like "Wow! This is my first AM-phone QSO!!!" Note that the crystal supplied with the kit is for the CW portion of the band. You will need to purchase a suitable crystal to operate this transmitter on phone. Mizuho also offers a "VFO-7" kit for the QP-7 and QP-21 transmitters.

Figure 10. Simple combination

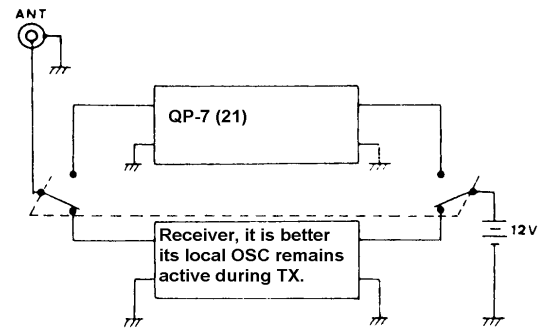


Figure 11. Communications RX

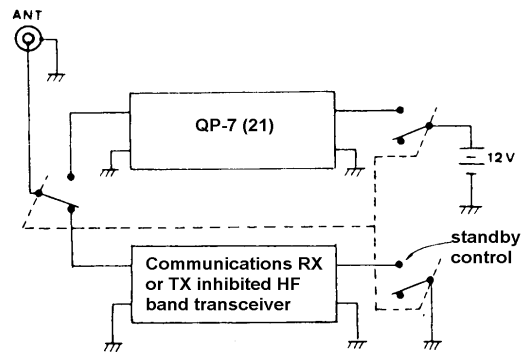


Figure 12. Shortwave radio

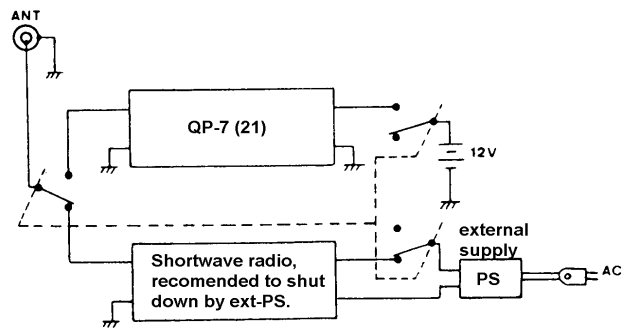
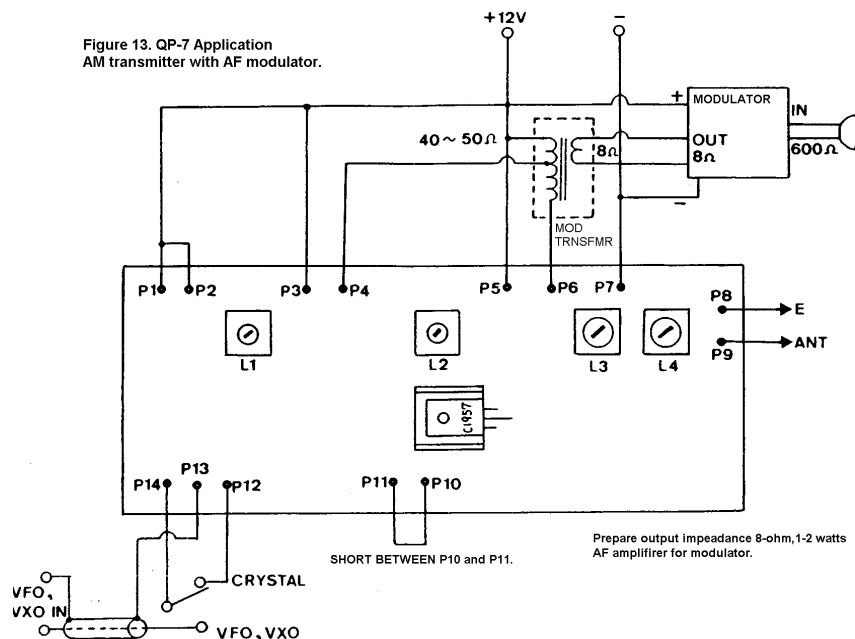


Figure 13. QP-7 Application AM transmitter with AF modulator.



## QP-7,21 Parts Table

| check | parts id         | Parts QP-7         | Parts QP-21        | num. | Reference           |
|-------|------------------|--------------------|--------------------|------|---------------------|
|       |                  | PIN terminal       | ☞                  | 14   | figure-3            |
|       | L1,L2            | Mizuho coil SL-113 | Mizuho coil SL-111 | 2    | case shielded       |
|       | L3,L4            | Mizuho coil SL-95  | Mizuho coil SL-96  | 2    | 8mm dia coil        |
|       | CH1              | Mizuho SL-15       | ☞                  | 1    | 5mm dia coil        |
|       | Q1               | 2SC945             | ☞                  | 1    |                     |
|       | Q2               | 2SC1959            | ☞                  | 1    |                     |
|       | Q3               | 2SC1957            | ☞                  | 1    | figure-6 to install |
|       | Socket           | for crystal        | ☞                  | 1    | HC-25U type         |
|       | Crystal1         | Crystal 7025KHz    | Crystal 21135kHz   | 1    | use socket          |
|       | R1               | 22K-Ohm 1/4W       | ☞                  | 1    | red-red-org         |
|       | R2,5             | 4.7K               | ☞                  | 2    | yel-pur-red         |
|       | R3,4             | 1K                 | ☞                  | 2    | brn-blk-red         |
|       | R6               | 10K                | ☞                  | 1    | brn-blk-org         |
|       | R7,8             | 100-Ohm            | ☞                  | 2    | brn-blk-brn         |
|       | R9               | 22                 | ☞                  | 1    | red-red-blk         |
|       | R10              | 470                | ☞                  | 1    | yel-pur-brn         |
|       | C1               | capacitor 0.001uF  | ☞                  | 1    | "102"               |
|       | C2,4,8,<br>10,11 | 0.01uF             | ☞                  | 5    | "103"               |
|       | C3               | 15pF               | ☞                  | 1    | 15                  |
|       | C5               | 150pF              | ☞                  | 2    | "151"               |
|       | C6               | 68pF               | 33pF               | 1    | 68 or 33            |
|       | C7               | 10uF 16V           | ☞                  | 1    | 10uF                |
|       | C9               | 15pF               | 39pF               |      |                     |
|       | C12              | 0.047uF            | 0.001uF            | 1    | "473" or "102"      |
|       | C13              | 330pF              | 47pF               | 2    | "331" or "47"       |
|       | C14              | 330pF              | 180pF              |      |                     |
|       | C15              | 180pF              | 150pF              | 1    | "181" or "151"      |
|       |                  | circuit board      | ☞                  | 1    |                     |
|       |                  | 51-ohm resistor    | ☞                  | 1    | for alignment       |
|       |                  | LED with one-turn  | ☞                  | 1    | for alignment       |
|       |                  | spacer             | ☞                  | 2    | for installation    |
|       |                  | 3mm ISO bolt       | ☞                  | 2    | for installation    |
|       |                  | spring washer      | ☞                  | 2    | for installation    |
|       |                  | nut                | ☞                  | 2    | for installation    |
|       |                  | solder wire        | ☞                  |      |                     |

You can pass the authorized transmitter inspection of JARL as for 10W station if you submit the block diagram of QP-7(21).

This manual is voluntary translated by JA-QRPers.

This is not the official documentation of MIZUHO corporation.

1998/04/22 Version 2.1 JO1ACW, JE2CDC, JN2FSE, JL1KRA (tnx to AC6AN)