

Contents

Precautions

Open the Box and Check It

Supplied Accessories

Battery/Antenna and Other Accessories

Charging the NiCd Battery

Installing/Removing the Battery

Installing the Antenna

Installing the Belt Hook

Installing the Additional Speaker/Microphone

Getting Acquainted

Basic Operation

Auxiliary Function

Time-out Timer

Power Saving

Low Battery Warning

Monitor

QT & DQT

Channel Scan

Busy Channel Lockout

Optional Accessories

Trouble Shooting Guide

Frequency Form

Precautions

Only qualified technicians are allowed to maintain this product.

Do not use the transceiver or charge a battery in explosive areas such as coal gas, dust, steam, etc.

Switch OFF the transceiver while refueling or parking at gas station.

Do not modify or adjust this transceiver without permission.

Do not expose the transceiver to direct sunlight over a long time, nor place it close to heating source.

Do not place the transceiver in excessively dusty, humid areas, nor on unstable surfaces.

Security: The operator should have enough acquaintance with common hazards to the operation of any transceiver.

Open the Box and Check It

Please carefully take the transceiver out of the box. We recommend that you confirm the items listed in the following table before discarding the box. If any items are missing or have been damaged during shipment, file a claim with the carrier immediately.

Supplied Accessories	
Item	Quantity
Antenna	1
Battery charger	1
AC adapter	1
TB-82 NiCd battery (7.2V 800mAH)	1
Belt hook	1
Instructions manual	1
Strap	1

The following statement will be added here in the Owner’s Manual.

FCC REQUIREMENTS

The RPV516A portable radio must be properly licensed by the Federal Communications Commission (FCC) prior to use. Your local RELM dealer can assist you in meeting this requirement.

Battery/Antenna and Other Accessories

Charging the NiCd Battery

The battery is not charged in factory, charge it before use. When first charge the battery after purchase or extended storage (more than 2 months), battery capacity is lower than its normal operating capacity. Repeating the charge/discharge cycle two or three times, its capacity will increase to normal.

Caution:

Do not recharge the battery if it is already fully charged. Doing so may shorten the life of the battery or cause damage to it.

After charging the battery, disconnect it from the charger, otherwise, battery life will be shortened as a result of overcharge.

Please turn OFF the power of the transceiver with a NiCd battery before charging. Using the transceiver while charge its battery will interfere with correct charging.

If battery capacity doesn't reach its normal state after being fully charged, that means battery life is over, please change new battery.

Do not short-circuit the battery terminals or dispose of the battery by fire. Never remove the casing from the battery pack.

Installing/Removing the Battery

Position the four grooves on the inside edges of the battery pack over the corresponding guides on the back of the transceiver. Slide the battery pack along the back of the transceiver until the release latch on the base of transceiver locks.

To remove the battery pack, grasp the pack near its tabs, pull back on the release latch, then slide the pack away from the transceiver.

Installing the Antenna

Hold the antenna at its base, screw the antenna into the connector on the top panel of the transceiver.

Installing the Belt Hook

Position the edge of belt hook on the corresponding grooves on the top of the battery pack. Push the belt hook along the back of the battery pack until the release latch locks.

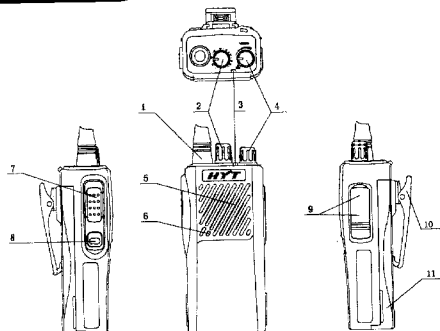
To remove the belt hook, pull back on the release latch located between the battery pack and the belt hook, and slid the belt hook away from the battery pack.

Installing Additional Speaker/Microphone

Remove the cover of the speaker/microphone jacks, then insert the speaker/microphone plugs into the speaker/microphone jacks.

Note: The transceiver is not fully water resistant while using speaker/microphone.

Getting Acquainted



1. Antenna

2. Channel selector

Rotate the selector to select channels 1-16 (the 16th channel can be programmed by dealer as scan function)

3. LED indicator

Lights red while transmitting. Lights green while receiving a signal. Flashes red when the battery voltage is low while transmitting.

4. Power/Volume control

Turn clockwise to switch the power ON. To switch OFF the transceiver, turn counterclockwise until a click sounds. Rotate to increase or decrease the transceiver volume level.

5. Speaker

6. Microphone

7. PTT(Press to talk) switch

Press and hold PTT switch to talk, release it to receive.

8. Monitor key

Press and hold the key to turn the squelch OFF. You will hear background noise. Release the key to turn the squelch back ON.

9. Speaker/microphone jacks

10. Belt hook

11. Battery

Basic Operation

1. Switch ON the transceiver by turning the Power/Volume control clockwise.

A beep sounds.

2. Turning the Power/Volume control while press and hold Monitor key to adjust volume.

3. Rotate the Channel selector to select your desired channel.

You will hear audio from the speaker when receive an appropriate signal.

4. To make a call, press and hold the PTT switch, then speak into the microphone using your normal speaking voice.

Keep microphone 3-4cm from your lips.

5. Releases the PTT switch to receive.

Note: When battery voltage becomes too low, it stops transmitting and red light flashes. Please refer to auxiliary function "Low Battery Warning".

Auxiliary Functions

Time-out Timer

The purpose of Time-out Timer is to prevent one from using the same channel too long and from damage caused by transmitting too long time. If you keep the transceiver transmitting signal more than its limited time (set by your dealer, max time is 10 minutes), the transceiver will stop transmitting and a tone will sound. To stop the tone, release the PTT switch. Press the PTT switch again to resume transmitting.

Power Saving

This function decreases the amount of power used when a signal is not being received and no operations are being performed (no keys are being pressed, and no switches are being turned). While the channel is not busy and no operation is performed for 10 seconds, Power Saving turns ON. When a signal is received or an operation is performed, Power Saving turns OFF.

Low Battery Warning

Low Battery Warning alerts you when the battery needs to be recharged. While transmitting, if the power of battery goes below a pre-determined value, the red light will flash. When a tone sounds, the transceiver stops transmitting. Please replace or recharge the battery.

Monitor

The squelch circuit on the transceiver automatically mutes the speaker when no signals are present, so you will not hear background noise. Press and hold "Monitor" key to manually deactivate the squelch. This operation is especially useful for adjusting volume or receiving weak signal. The LED indicator lights green while the "Monitor" key is pressed.

QT & DQT

Some channels may have pre-programmed QT/DQT tones. A QT/DQT tone is a sub-audible signal, which allows you to ignore (not hear) calls from other parties using the same channel.

When you receive a signal that has a tone different from the one set up in your transceiver, you will not hear the signal. Likewise, signals that you transmit will only be heard by parties whose QT/DQT tone matches the tone set up in your transceiver.

Note: Although using channels set up with QT/DQT tones enables you to avoid hearing those unwanted calls, it does not mean your calls will be private.

Channel Scan (This function can be programmed as OFF by your dealer)

Turn Channel selector to 16, the transceiver automatically checks those channels was programmed as scan items in channel 1-15 for activity (your local dealer can set any channel as scan item or non-scan item). If a conversation is initiated on any of the channels that the transceiver is scanning, the transceiver will stop on the active channel and you will able to hear the conversation.

Priority channel scan

Any programmed channel may be set as the priority channel. The transceiver monitors the priority channel while receiving on non-priority channel. When a signal is received on the priority channel, the transceiver will automatically go to the priority channel to communicate.

Revert channel

When the transceiver is scanning, press the PTT switch, it can transmit in pre-programmed revert channel.

Revert channel can be programmed by your dealer.

Busy Channel Lockout

If the channel you choose is set by your dealer as "busy channel lockout", and this channel is used by other user, pressing PTT causes the transceiver to generate a tone. The transceiver will not transmit in this situation. To stop the tone, release PTT. When this channel is free, press PTT to transmit.

Optional Accessories

Available optional parts:

TB-80: spare battery (7.2V/1000mAH)

TB-81: long-life battery (7.2V/1500mAH)

Charger

AC adapter

Head-set earphone

Speaker/microphone

Trouble Shooting Guide

Trouble	Solution
No power	Battery is used up. Please change battery or recharge it. Probably, battery is not properly installed. Remove the battery and install it again.
Power doesn't last long even if fully charged	Battery is out of use, please replace with new battery.
Can't talk to or hear other users in your group	Please make sure you are using the same frequency and QT/DQT tone as the other users in your group. Other group users may be too far away. Make sure you are within range of the other transceiver.
Other voices (Non-group users) are present on the channel	Please change QT/DQT tone. Be sure to change the tone on all transceivers in your group.

Catalog

General	P2
Specifications	P3
Mode Combination	P4
Circuit Description	P5
Software Description	P10
Test Description	P15
RPV516A Circuit Diagram	
RPV516APCB Component Diagram (Two layers Mech 1 and Mech 2 in PCB)	

General

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains main required service information and data for the equipment.

The following precautions are recommended for personal safety:

1. DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
2. SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
3. This equipment should be maintained by qualified technicians only.

PRELIMINARY – Service Manual

Main technical specifications

General	RPV516A (1)	RPV516A (2)
Frequency	136MHz~150MHz	150MHz~174MHz
Channel	16	
Channel space	25kHz / 12.5kHz	
Antenna impedance	50•	
Transmitter impedance	2K Ω	
Input voltage	7.2V DC	
Frequency stability	$\pm 2.5 \times 10^{-6}$	
TCX0	12.8MHz	
CPU clock Freq	7.3728MHz	
	Transmitter	
Frequency stability	$\pm 2.5 \times 10^{-6}$	
Output power	4.0±0.5W	
Operating sensitivity	12±4mV	
Audio distortion	≤ 5%	
Modulation limiting	≤ 5kHz / 2.5kHz	
Bandwidth	≤ 16 kHz/8kHz	
Modulate speciality	≤ ±3dB	
Spurious RF	≤ 7.5 μ W	
Adjacent power	≤ -65 d B / -55dB	
	Receiver	
Reference sensitivity	Precede 0.28•V / 0.35•V	
Squelch turnon sensitivity	≤ 0.4•V	
Audio frequency	500mW	
Audio deviation	≤ 7%	
Operating bandwidth	≥ ±7 kHz / ±3.5 kHz	
Audio response	≤ +2dB -8dB	
First IF Freq	38.85MHz	
Second IF Freq	450kHz	
Channel restrain	≥ -8 d B	
Obstruct	≥ 85d B	
Selectivity	≥ 65 d B / 60dB	
Spurious response	≥ 60 d B	
Intermodulation	≥ 60 d B	

PRELIMINARY – Service Manual

Mode combination

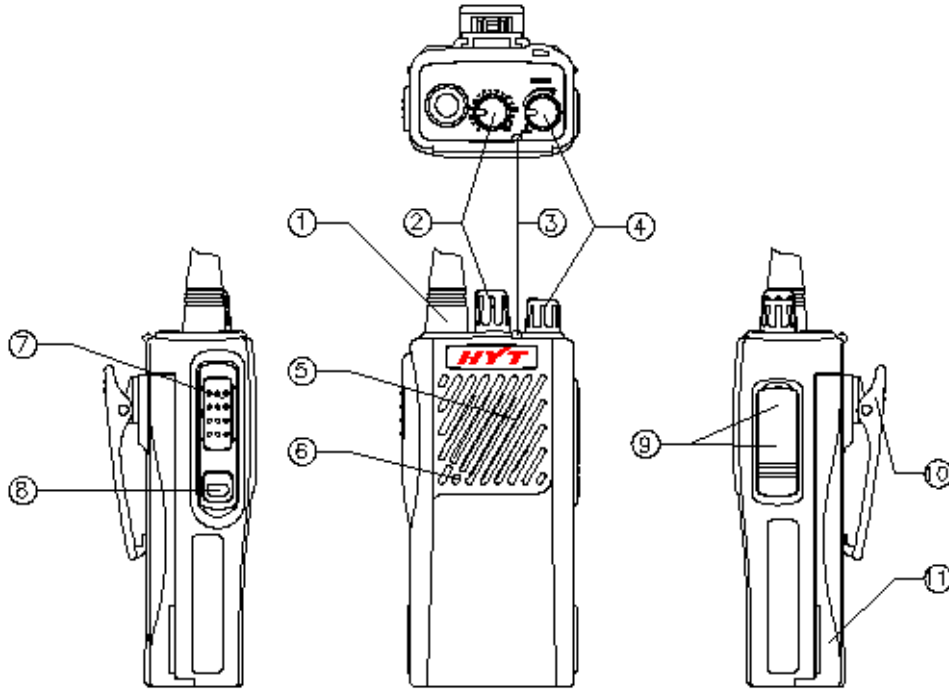
1. Mode

User mode: Turn on the power to enter.

PC mode: Set and adjust with PC software or programmer.

2. Parts description:

•Antenna



•Channel (frequency) selector knob

turn the knob to choose channel from 1~ 16•channel 16 may be set by distributor as scan channel••

•LED light

Lights red while transmitting, green while receiving a signal. Flashes red when the battery voltage is low, while transmitting.

•Power switch/Volume control

Turn the knob clockwise to switch the transceiver ON, anti-clockwise to turn off the power till there is a "click" sound , rotate to adjust the volume level.

(5)Speaker

•Microphone

•PTT•push to talk•switch

Press the button while transmitting, and release it while receiving.

•Monitor key

Press it to shut off squelch, noise could be heard, release to connect squelch.

•Speaker/microphone jack

•Belt clip

•Battery•TB-82•

Circuit Description

3. Frequency configuration

The receiver utilizes double conversion. The first IF is 38.85MHz and the second IF is 450KHZ. The first local oscillator signal is supplied from the PLL circuit.

The PLL circuit in the transmitter generates the necessary frequencies.

Fig.1 shows the frequencies.

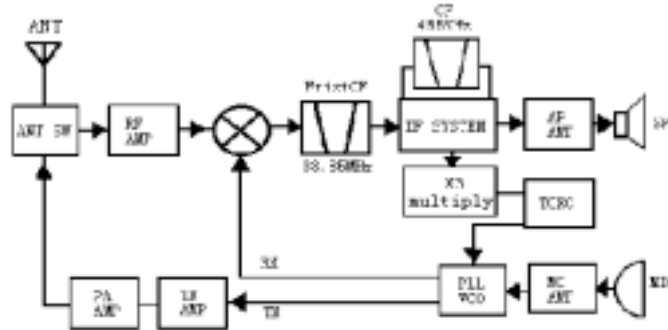


Fig1. Frequency configuration

4. Receiver

The receiver is double conversion superheterodyne, designed to operate in the frequency range of 150-174 MHz (M type), 136—150MHz•M2 type••

1) Front-end RF amplifier

An incoming signal from the antenna is applied to an RF amplifier(Q203) after passing through a transmit/receive switch circuit(D 102 and D103 are off) and a band pass filter(L208, L209 and L210). After the signal is amplified(Q203), the signal is filtered through a band pass filter (L203 and L214) to eliminate unwanted signals before it is passed to the first mixer. Band pass filters (L208, L209, L210, L203 and L214) have varactor diodes (D203, D204, D206, D202 and D201).

The voltage of these diodes are controlled by to track the MPU (IC403) center frequency of the band pass filter. (See Fig. 2)

PRELIMINARY – Service Manual

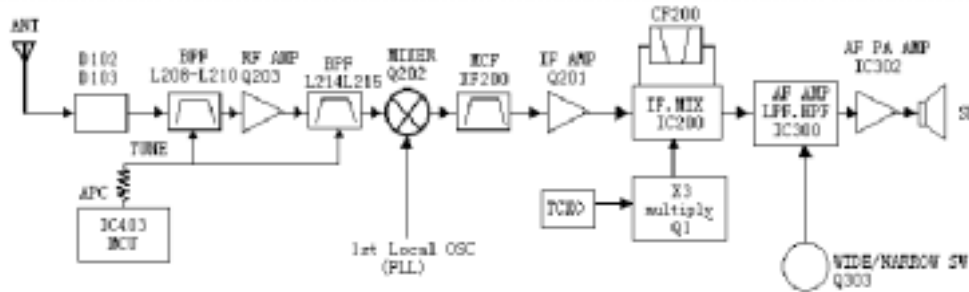


Fig. 2. Receiver section configuration

2) First Mixer

The signal from the RF amplifier is heterodyned with the first local oscillator signal from the PLL frequency synthesizer circuit at the first mixer (Q202) to create a 38.85 MHz first intermediate frequency (1st IF) signal. The first IF signal is then fed through two monolithic crystal filters (MCFs: XF200) to further remove spurious signals.

3) IF amplifier

The first IF signal is amplified by Q201, and then enters IC 200 (FM processing IC). The signal is heterodyned again with a second local oscillator signal within IC200 to create a 450kHz second IF signal. The second IF signal is then fed through a 450kHz ceramic filter (CF200) to further eliminate unwanted signals before it is amplified and FM detected in IC200.

4) AF amplifier

The recovered AF signal obtained from IC200 is amplified by IC300 (1/4), filtered by the IC300 low-pass filter (2/4) and IC300 high-pass filter (3/4) and (4/4), and de-emphasized by R303 and C306. The AF signal is then passed through a WIDE/NARROW switch (Q303). The processed AF signal passes through an AF volume control and is amplified to a sufficient level to drive a loud speaker by an AF power amplifier (IC302).

5) Squelch

Part of the AF signal from the IC enters the FM IC again, and the noise component is amplified and rectified by a filter and an amplifier to produce a DC voltage corresponding to the noise level. The DC signal from the FM IC goes to the analog port of the microprocessor (IC403). IC403 determines whether to output sounds from the speaker, IC403 sends a high signal to the MUTE and AFCO lines and turns IC302 on through Q302, Q304, Q305, Q306 and Q307. (See Fig.3)

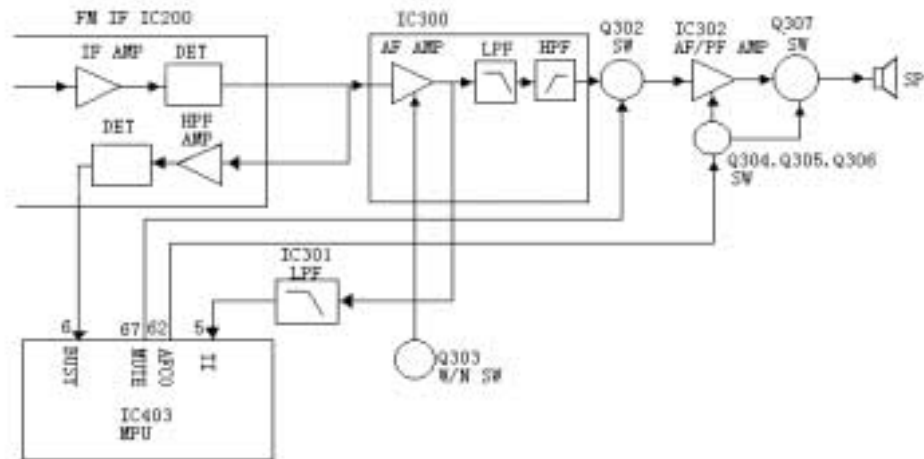


Fig.3. AF Amplifier and squelch

6) Receiving signaling

QT/DQT

300 Hz and higher audio frequencies of the output signal from IF IC are cut by a low-pass filter (IC301). The resulting signal enters the microprocessor (IC403). IC403 determines whether the QT or DQT matches the preset value, and controls the MUTE and AF/CO and the speaker output sounds according to the squelch results.

3. PLL frequency synthesizer

The PLL circuit generates the first local oscillator signal for reception and the RF signal for transmission.

2) PLL

The frequency step of the PLL circuit is 5 or 6.25KHz. A 12.8MHz reference oscillator signal is divided at IC1 by a fixed counter to produce the 5 or 6.25KHz reference frequency. The voltage controlled oscillator (VCO) output signal is buffer amplified by Q6, then divided in IC1 by a dual-module programmable counter. The divided signal is compared in phase with the 5 or 6.25KHz reference signal in the phase comparator in IC1. The output signal from the phase comparator is filtered through a low-pass filter and passed to the VCO to control the oscillator frequency. (See Fig. 4)

2) VCO

PRELIMINARY – Service Manual

The operating frequency is generated by Q4 in transmit mode and Q3 in receive mode. The oscillator frequency is controlled by applying the VCO control voltage, obtained from the phase comparator, to the varactor diodes (D2 and D4 in transmit mode and D1 and D3 in receive mode). The T/R pin is set high in receive mode causing Q5 and Q7 to turn Q4 off, and turn Q3 on. The T/R pin is set low in transmit mode. The outputs from Q3 and Q4 are amplified by Q6 and sent to the buffer amplifiers.

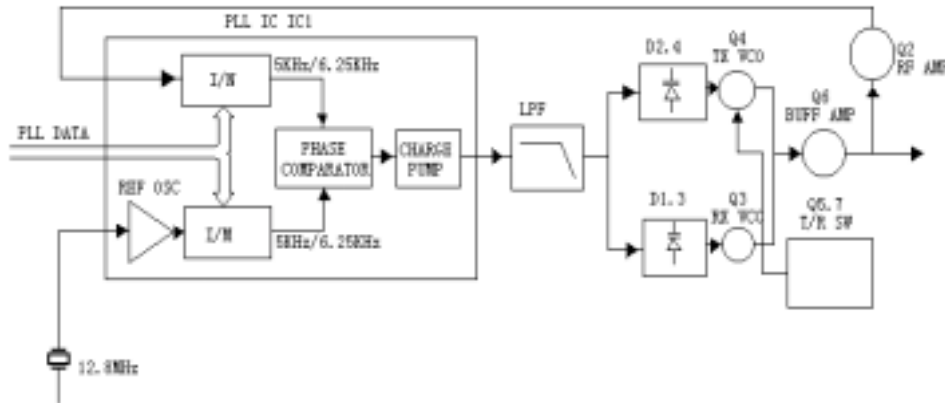


Fig. 4. PLL circuit

4) UNLOCK DETECTOR

If a pulse signal appears at the LD pin of IC1, an unlock condition occurs, and the DC voltage obtained from D7, R6, and C1 causes the voltage applied to the UL pin of the microprocessor to go low. When the microprocessor detects this condition, the transmitter is disabled, ignoring the push-to-talk switch input signal. (See Fig. 5)

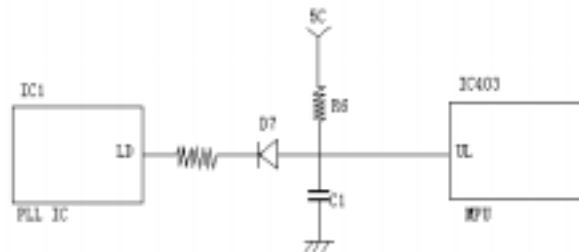


Fig.5. Unlock detector circuit

4•Transmitter

1•Transmit audio

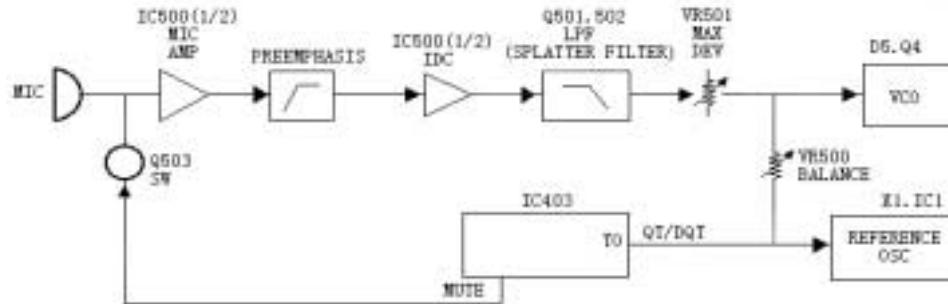
The modulation signal from the microphone is amplified by IC500 (1/2), passes through a preemphasis circuit, and amplified by the other IC500 (1/2) to perform IDC operation. The signal then passes through a low-pass filter (splatter filter) (Q501 and Q502) and cuts 3kHz and higher

PRELIMINARY – Service Manual

frequencies. The resulting signal goes to the VCO through the VCO modulation terminal for direct FM modulation. (See Fig. 6)

7) QT/DQT encoder

A necessary signal for QT/DQT encoding is generated by IC403 and FM-modulated to the PLL reference signal. Since the reference OSC does not modulate the loop characteristic frequency or higher, modulation is performed at the VCO side by adjusting the balance. (See Fig. 6)



•6. Transmit audio QT/DQT

8) VCO and RF amplifier

The transmit signal obtained from the VCO buffer amplifier Q100, is amplified by Q101. This amplified signal is passed to the power amplifier, Q102 and Q105, which consists of a 2-stage FET amplifier and is capable of producing up to 5W of RF power (See Fig. 7)

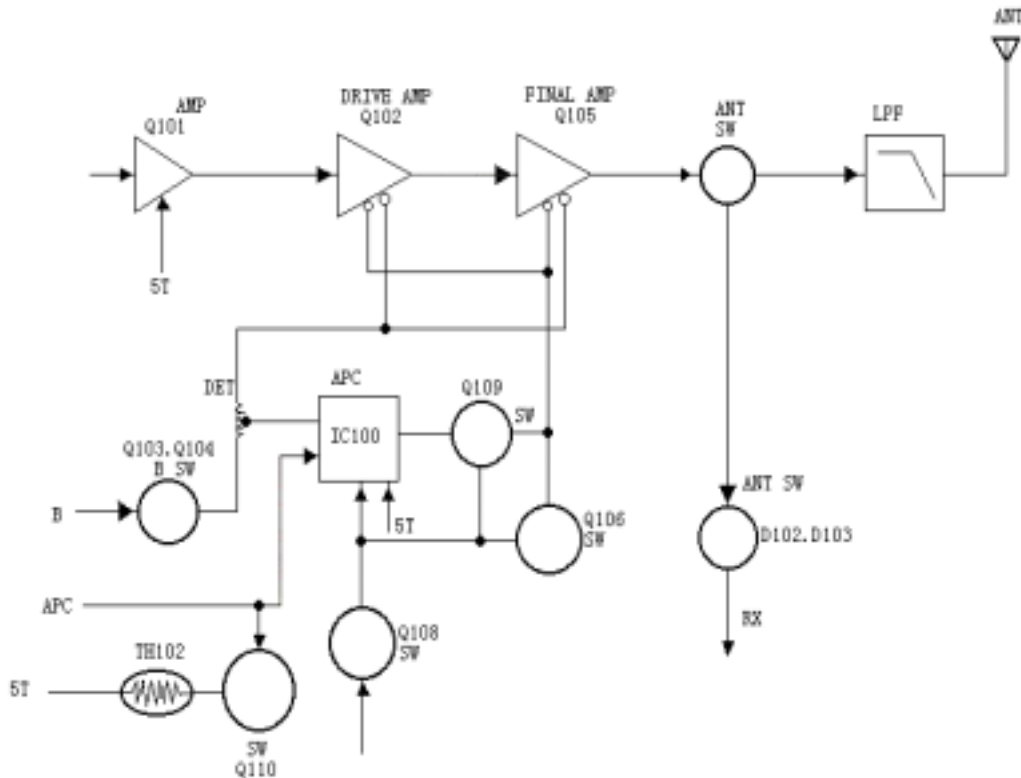


Fig. 7. APC system

9) ANT switch and LPP

The RF amplifier output signal is passed through a low-pass filter network and a transmit/receive switching circuit before it is passed to the antenna terminal. The transmit/receive switching circuit is comprised of D101, D102 and D103. D102 and D103 turned on (conductive) in transmit mode and off (isolated) in receive mode.

10) APC

The automatic power control (APC) circuit stabilizes the transmitter output power at a predetermined level by sensing the drain current of the final amplifier Field Effect Transistor (FET). The voltage obtained from the above drain current with a reference voltage which is set using the microprocessor. An APC voltage proportional to the difference between the sensed voltage and the reference voltage appears at the output of IC100 (1/2). This output voltage controls the gate of the FET power amplifier, which keeps the transmitter output power can be varied by the microprocessor which in turn changes the reference voltage and hence, the output power.

11) Terminal protection circuit

When the thermistor (TH102) reaches about 80°C the protection circuit

PRELIMINARY – Service Manual

turns on Q110 to protect transmitting final amplifier (Q107).

5•Power supply

A 5V reference power supply [5M] for the control circuit is derived from an internal battery. This reference is used to provide a 5V supply in transmit mode [5T] ,a 5V supply in receive mode [5R] , and a 5V•supply common in both modes [5C] based on the control signal sent from the microprocessor.

6•Control system

The IC403 CPU operates at 7.37MHZ. This oscillator has a circuit that shifts the frequency according to the EEPROM data.

RPV516A/TC368 software specifications

一. Specifications•

1. Use mechanical knob to choose from 16 channels.
Frequency
VHF:136~150MHz•VHF:150~174MHz•UHF:400~420MHz•UHF:450~470MHz
2. Monitor
3. Auto power saving
4. Audio alarm
5. Auto squelch control (0~9 level)•
6. Timing
7. Channel space 25KHz/12.5KHz(Wide/Narrow)
8. CTCSS&DQT encode
9. CTCSS &DQT decode
10. Busy channel lock
11. Clock frequency deviation
12. Scan
13. PC mode
14. PC modifying mode
15. Wire clone
16. Manual modifying mode

二. Description•

1. User mode•general radio mode
2. PC mode•
Make settings through external programmer or PC program software•
 - (1) Receive frequency &transmit frequency
 - (2) Receive signaling& Transmit signaling
 - (3) Lock busy channel
 - (4) Clock frequency deviation
 - (5) Timing
 - (6) Squelch level selectivity
 - (7) Power saving
 - (8) Audio Alarm
 - (9) Channel space 25KHz/12.5KHz(Wide/Narrow)
 - (10) Monitor mode
 - (11) Scan mode

PRELIMINARY – Service Manual

- (12) Reset scan mode
- (13) Scan priority

3. PC modify mode•

Make settings through external programmer or PC program software:

- (1) Frequency stability
- (2) RF power
- (3) Low power alarm
- (4) Squelch level 9&3•
- (5) CTCSS deviation•Wide/Narrow••
- (6) DQT deviation•Wide/Narrow••
- (7) Receive sensitivity•low•medium•high•

4. Wire Clone:

Press MONI to turn on the power , enter wire clone mode 2 seconds later, press PTT,

Begin cloning while red lights, finish while light goes out.

5. Mode setting:

- Short cut the SELF on PCB, and turn on the power till "BEEP".
- Set channel selector knob to corresponding place according to the model•1-16•
- Press [MONI]•then press [PTT], to set the channel, channel data and initial data.

• Turn off the power, disconnect SELF on PCB to end mode settings.
Eg. RPV516A•2•, its serial number is 2, to initialize: short cut SELF on PCB to turn on

The power, set channel selector knob at CH2, press MONI, then press PTT, the initial data of 1-4 channel can be found in the diagram, serial number 2. Reset data to initial data. The receive and transmit frequency of channel 5-14 are the same with channel 1, signals are channel5, 10•67.0Hz•6,11•151.4Hz•7,12•250.3Hz•8,13•423•DQT••9,14•423•DQT•, Channel 1-9 are Wide , Channel 10-14 are Narrow•Turn off the power after reset, disconnecting SELF and restart the power to use the transceiver.

- Remarks:

The old data(frequency, CTCSS/DQT, channel function) will be deleted once set the new mode by pressing MONI AND PTT , part of the function also would be changed. Therefore, do not set this operation unless change the EEPROM, etc.

PRELIMINARY – Service Manual

•RPV516A/TC368 channel frequency diagram (after setting):

No	Model	Frequency(MHz)	Initial (MHz)	IF(MHz)	1CH		2CH(central)		3CH(●)		4CH(H)	
					Tx(MHz)	Rx(MHz)	Tx(MHz)	Rx(MHz)	Tx(MHz)	Rx(MHz)	Tx(MHz)	Rx(MHz)
1	RPV516 A(1)	136.000~149.995	140.000	+38.85	143.100 0	143.100 0	143.000 0	143.100 0	136.000 0	136.100 0	149.975 5	149.900 0
2	RPV516 A(2)	150.000~173.995	150.000	+38.85	162.100 0	162.100 0	162.000 0	162.100 0	150.000 0	150.100 0	173.975 5	173.900 0
3	TC368(1)	400.000~419.995	410.000	-38.85	410.100 0	410.100 0	410.000 0	410.100 0	400.000 0	400.100 0	419.975 5	419.900 0
4	TC368(2)	450.000~469.995	450.000	-38.85	460.100 0	460.100 0	460.000 0	460.100 0	450.000 0	450.100 0	469.975 5	469.900 0
5		350.000~369.995	360.000	-38.85	360.100 0	360.100 0	360.000 0	360.100 0	350.000 0	350.100 0	369.975 5	369.900 0
6		370.000~389.995	380.000	-38.85	380.100 0	380.100 0	380.000 0	380.100 0	370.000 0	370.100 0	389.975 5	389.900 0
7		220.000~239.995	230.000	-38.85	230.100 0	230.100 0	230.000 0	230.100 0	220.000 0	220.100 0	239.975 5	239.900 0
8		240.000~259.995	250.000	-38.85	250.100 0	250.100 0	250.000 0	250.100 0	240.000 0	240.100 0	259.975 5	259.900 0
9		406.000~429.995	410.000	-38.85	418.100 0	418.100 0	418.000 0	418.100 0	406.000 0	406.100 0	429.975 5	429.900 0
10		144.000~147.995	145.000	+38.85	146.100 0	146.100 0	146.000 0	146.100 0	144.000 0	144.100 0	147.975 5	147.900 0
11		336.000~367.995	350.000	-38.85	352.100 0	352.100 0	352.000 0	352.100 0	336.000 0	336.100 0	367.975 5	367.900 0
12		268.000~395.995	380.000	-38.85	382.100 0	382.100 0	382.000 0	382.100 0	268.000 0	268.100 0	395.975 5	395.900 0

PRELIMINARY – Service Manual

13		430.000~439.995	430.000	-38.85	435.100	435.100	435.000	435.100	430.000	430.100	439.975	439.900
14		438.000~449.995	440.000	-38.85	444.100	444.100	444.000	444.100	438.000	438.100	449.975	449.900
15		465.000~494.995	480.000	-38.85	480.100	480.100	480.000	480.100	465.000	465.100	494.975	494.900
16		490.000~519.995	500.000	-38.85	505.100	505.100	505.000	505.100	490.000	490.100	519.975	519.900

Initialization data of channel are in the above diagram CH1-CH4 •the modify frequency is reset to initial data . Frequency of Channel 5-14 are the same with Channel 1•signals are 5,10•67.0Hz•6, 11•151.4Hz•7,12•250.3Hz•8, 13•423•DQT•9, 14 •423•DQT•. Channel 1-9 are Wide, Channel 10-14 are Narrow•

6. Manual Modify Mode

Press PTT and MONI simultaneously to turn on the power•enter manual modify mode out 3 seconds later. Choose the settings by turning the channel selector knob 1-12CH, use PTT•upward•or MONI•downward•to modify•Notice: MIC shouldn't be connected with external cable while modifying•,1 ~ 12CH are defined as follows:

- (1) Frequency stability
- (2) RF power
- (3) Low power alarm
- (4) Receiver sensitivity•IF point modify)
- (5) Receiver sensitivity•low point modify)
- (6) Receiver sensitivity (high point modify)
- (7) Squelch•level 9•
- (8) Squelch•level 3•
- (9) CTCSS deviation•Wide•
- (10) CTCSS deviation•Narrow•
- (11) DQT deviation•Wide•
- (12) DQT deviation•Narrow•

13~16CH are used for adjusting transmitter and receiver. Press PTT to transmit; Press MONI to choose: Wide/Narrow•one Beep sound is Narrow•two Beep sound is Wide. 13~16CH are defined as follows:

- (13) IF frequency (discrepancy of transmission and receive frequency is 0.1MHz).
- (14) Lowest frequency (discrepancy of transmission and receive frequency is 0.1MHz).
- (15) Highest frequency (discrepancy of transmission and receive frequency is -0.075MHz)•
- (16) IF frequency•sends 250.3Hz CTCSS signals (discrepancy of transmission and receive frequency is 0.1MHz).

Notice:To enter and shut off manual modify mode by short cut the SELF. Turn on the power, and enter settings mode, the manual function is automatically on. Press [PTT] to disable manual modify. Once this function is disabled, this mode is not accessible, kindly suggest disable this mode after modifying.

PRELIMINARY – Service Manual

Pin No.	Port name	I/O	Function
1	TI	I	Input QT/DQT signal
2	BUSY	I	Input busy signal
3	BATT	I	Detect battery voltage
4	NC	I	NC
5	TO	O	Output QT/DQT
6	BEEP	O	Beep output
7	NC	I	NC
8	ENC0	I	Input encode
9	ENC1	I	Input encode
10	ENC2	I	Input encode
11	ENC3	I	Input encode
12	NC	I	NC
13	PTT	I	[PTT] input •connect RXD
14	TXD	O	RS-232C output
15	RXD	I	RS-232C input
16	MONI	I	[MONI] input
17	SELF	I	program L•set up mode
18	CNVSS	I	Connect VSS
19	RST	I	Reset
20	INT0	I	Power detection
21	NC	I	NC
22	XIN	I	Oscillator•7.3728MHz•
23	XOUT	O	Oscillator
24	VSS	I	Grounding
25	SHIFT	O	Clock frequency deviation H•unlock
26	PABC	O	MOS FET power H•unlock
27	WNRC	O	Audio referential sensitivity L•narrow
28	WNTC	O	Max deviation H•narrow
29	NC	I	NC
30	SDA	I/O	EEPROM data cable
31	SCL	O	EEPROM clock cable
32	UL	I	Lock circuit detector L•unlock
33	DT	O	Common data output
34	CK	O	Common clock output
35	LE	O	PLL IC H•lock up
36	5MC	O	Power control except CPU and EEPROM L•unlock
37	AFCO	O	AF amplifier H•unlock
38	RX	O	TX/RX VCO H•receive
39	GLED	O	Green light control H•light
40	RLED	O	Red light control H•light
41	SAVE	O	Power saving control H•power saving OFF
42	MUTE	O	Squelch control H•Mic squelch L•AF squelch
43	5RC	O	Receiver power control L•unlock
44	5TC	O	Transmitter power control H•unlock

PRELIMINARY – Service Manual

45	NC	I	NC
46	NC	I	NC
47	NC	I	NC
48	NC	I	NC
49	NC	I	NC
50	NC	I	NC
51	NC	I	NC
52	NC	I	NC
53	NC	I	NC
54	NC	I	NC
55	VCCN	O	Frequency output
56	APC	O	TX•auto frequency output RX•BPF tune output
57	VCC	I	CPU input power 5V
58	VREF	I	Connect with VCC
59	AVSS	I	Connect with VSS
60	NC	I	NC
61	NC	I	NC
62	NC	I	NC
63	NC	I	NC
64	TIBI	I	QT/DQT exterior circuit central point input

RPV516 adjust description

Use programmer or PC software to program RPV516, or by manual program , eg . To program RPV516A(refer to"RPV516/TC368 software description"for the manual

program and mode settings•.

一. Instrument•

- 1• Synthesized test instrument 1 set
- 2• Scanner 1 set
- 3• 3A/10V power 1 set
- 4• Digital Voltmeter 1 set
- 5• 3A DC Ammeter 1 set

•• Adjust•

1. Initialization : It is necessary to initialize the transceiver because there is useless data in EEPROM. Short cut the SELF on PCB, turn on the power till there comes the sound "BEEP"•place the channel selector knob at CH1[RPV516B•1•] or CH2[RPV516A(2)]• press [MONI]• then press [PTT]• to begin initializing the channel and other data. Please refer to the outcome of initialization at"RPV516/TC368 software description".
2. Adjust : The adjustment of RPV516, some are conducted in normal mode, some are in manual program mode. Turn on the power and enter the normal mode., at the same time, press the PTT and MONI to turn on the transceiver•enter the manual program mode 3seconds later. refer to"RPV516/TC368 software description"manual program mode•.

VCO SECTION:

ITEM	CONDITION	measurement		Adjustment		Specifications/ Remarks
		Test equip	terminal	part	Method	
1.Setting	1.power 7.5V					
2.Transmit VCO lock voltage	1.CH: TX HIGH	Digital Voltmeter	CV	TC1	3.7V±0.1V	
	2.CH: TX LOW				check	•0.7V
3.Receive VCO lock voltage	1.CH: RX HIGH				3.7V±0.1V	
	2.CH: RX LOW				check	

Notice : if unlock VCO, check adjustment is enabled in manual mode. (signal could be transmitted regardless of the lock of VCO in manual mode) .

PRELIMINARY – Service Manual

Adjust the receiver section: (enter manual mode)

Item	Condition	Measurement		Adjustment		Specifications/Remarks
		Test equip	Terminal	parts	Method	
4.Band-pass filter	1.CH:RX center turn to channel 4 in manual mode	Spectrum analyzer	ANT . TP2	TC201	Adjust the undee to the top, the bandwidth is about 10MHz, the sign of central frequency is in the middle of the undee	
	2. CH: RX LOW turn to channel 5 in manual mode			PTT(up) MONI (down)	Adjust the undee to the top to receive Low frequency , the sign is on the left of the top of the undee	
	3.CH:RX HIGH turn to channel 6 in manual mode			PTT(up) MONI (down)	Adjust the undee to the top to receive High frequency , the sign is on the right of the top of the undee	
5.Sensitivity (Wide)	1. CH:RX center Turn to channel 13 in manual mode dev : Wide	Synthetical test SSG output : -118dBm MOD:1kHz DEV:±3kHz FILER: 0.3-3.4kHz	ANT SP		check	SINAD: 12dB or higher
	2. CH: RX center Turn to channel 14 in manual mode dev : Wide					
	3. CH: RX center Turn to channel 15 in manual mode dev : Wide					
6.Sensitivity (Narrow)	1. CH: RX center Turn to channel 13 in manual mode Dev : narrow	Synthetical test SSG output : -116dBm MOD:1kHz DEV:±1.5kHz FILER: 0.3-3.4kHz	ANT SP		check	SINAD: 12dB or higher
	2. CH: RX center Turn to channel 14 in manual mode Dev : narrow					
	3. CH: RX center Turn to channel 15 in manual mode dev : narrow					
7.Squelch	1.CH: RX center Turn to channel 7 in manual mode	Synthetical test SSG output : -117dBm	ANT SP	PTT(up) MONI (down)	Level 9 Adjust to close the squelch.	The squelch must be closed
	1.CH:RX center Turn to channel 8 in manual mode	Synthetical test SSG output : -			Level 3 Adjust to close the squelch.	The squelch must be closed

PRELIMINARY – Service Manual

manual mode	output : 125dBm	-			closed
-------------	--------------------	---	--	--	--------

Adjust the Transmitter section:

Item	Condition	Measurement		Adjustment		Specifications/Remarks
		Test equip	Terminal	Parts	Method	
8.Transmet frequency	CH: TX center Turn to channel 1 in manual mode	Synthetical test	ANT	PTT•up•MO NI•down•	Adjust it to center frequency	error•150Hz
9.Power	1.CH:TX center Turn to channel 2 in manual mode	Synthetical test Ammeter	ANT	PTT•up•MO NI•down•	Adjust it to:4.0•Po•4.8 W I•1.6A	
	2.CH: TX LOW Turn to channel 3 Press PTT				Check:4.0•Po•4.8W I•1.6A	
	3.CH:TX HIGH Turn to channel 4 Press PTT				Check:4.0•Po•4.8 W I•1.6A	
10.MAX DEV	1.CH: TX center, turn to channel 13 in manual mode, dev: wide Press PTT	Synthetical test LPF: 15kHz AF:1kHz 120mV	ANT MIC	VR501	Adjust it to:4.2kHz±100Hz	Wide
	2.CH: TX center, turn to channel 13 in manual mode, dev: narrow Press PTT				Check:1.8kHz-2.2kHz	Narrow
11.MIC SENS	1.CH: TX center, turn to channel 13 in manual mode, dev: wide Press PTT	Synthetical test FILER: 0.3- 3.4kHz AF:1kHz 12mV	ANT MIC	VR501	Check:2.2kHz-3.6kHz	Wide
	2.CH: TX center, turn to channel 13 in manual mode, dev: narrow Press PTT				Check:1.1kHz-1.8kHz	Narrow
12.DQT/QT	1.CH: TX center, turn to channel 9 in manual mode	Synthetical test LPF: 300Hz	ANT	VR500	Adjust VR500,the test value of on condition 1 & condition 2 is consistent, the difference value•20Hz	67.0Hz CTCSS
	2.CH: TX center, turn to channel 16 in manual mode, press PTT					250.3Hz CTCSS

PRELIMINARY – Service Manual

13.QT DEV	1.CH: TX center, turn to channel 9 in manual mode	Synthetical test LPF:300Hz	ANT	PTT•up•MO NI•down•	Adjust it to:0.75kHz±50Hz	Wide
	2.CH: TX center, turn to channel 10 in manual mode				Adjust it to:0.35kHz±50Hz	Narrow
14.DQT DEV	1.CH: TX center, turn to channel 11 in manual mode				Adjust it to:0.75kHz±50Hz	Wide
	2.CH:TX center, turn to channel 12 in manual mode				Adjust it to:0.35kHz±50Hz	Narrow
15.Low Battery level	Turn to channel 3 in manual mode, Adjust the battery to 5.8V	Digital voltmeter		PTT•up•MO NI•down•	Adjust so that the LED flashes	

Notice : In manual mode , channel selector 1-12, MIC can't connect line, after adjust complete, short SELF, enter mode setting, press PTT, disable manual adjust.