

APPENDIX 5
USERS MANUAL

FIVE (5) PAGE USER INSTRUCTIONS FOLLOW THIS SHEET

USERS MANUAL
FCC ID: MGPFR-460

APPENDIX 5

USER'S MANUAL



**14 Channel Micro-Size
Family Radio Service (FRS)
Hand Portable Radio**

Model : FR-460



INTRODUCTION

Congratulations on your purchase of the CHEROKEE™ FR-460 Micro Size Family Radio Service (FRS) Portable Radio. Your CHEROKEE™ radio is designed to provide trouble-free service and advanced user features to make it the premier choice in radio communications.

THE FAMILY RADIO SERVICE (FRS)

The Federal Communications Commission (FCC) created 14 channels for the general public use. The output of the radio is limited 500mW Effective Radiated Power (ERP) to avoid interference and has a capability to communicate up to 2 miles (under best conditions).

GENERAL FEATURES OF FR-460

- Extremely small size and light weight
- Easy viewing wide LCD display
- Back light on the LCD panel and all the front panel buttons
- CPU controlled frequency synthesizer for reliable operation
- CTCSS or DCS system to avoid listening to interference
- Operates on 3 AAA alkaline battery or Ni-Mh Rechargeable Pack.
- Connector for external Microphone and Loudspeaker
- Belt Clip and hand strap for easy carrying
- Choice of colors for the case
-

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- 1) This device may not cause harmful interference
- 2) This device must accept any interference received, including interference that may cause undesired operation.

!! WARNING !!

Replacement or substitution of transistors, regular diodes or other parts of a unique nature, with parts other than those recommended by Cherokee Electronics, may cause violation of the technical regulations of Part 95 of the FCC Rules, or violation of Type Acceptance requirements of Part 2 of the Rules.

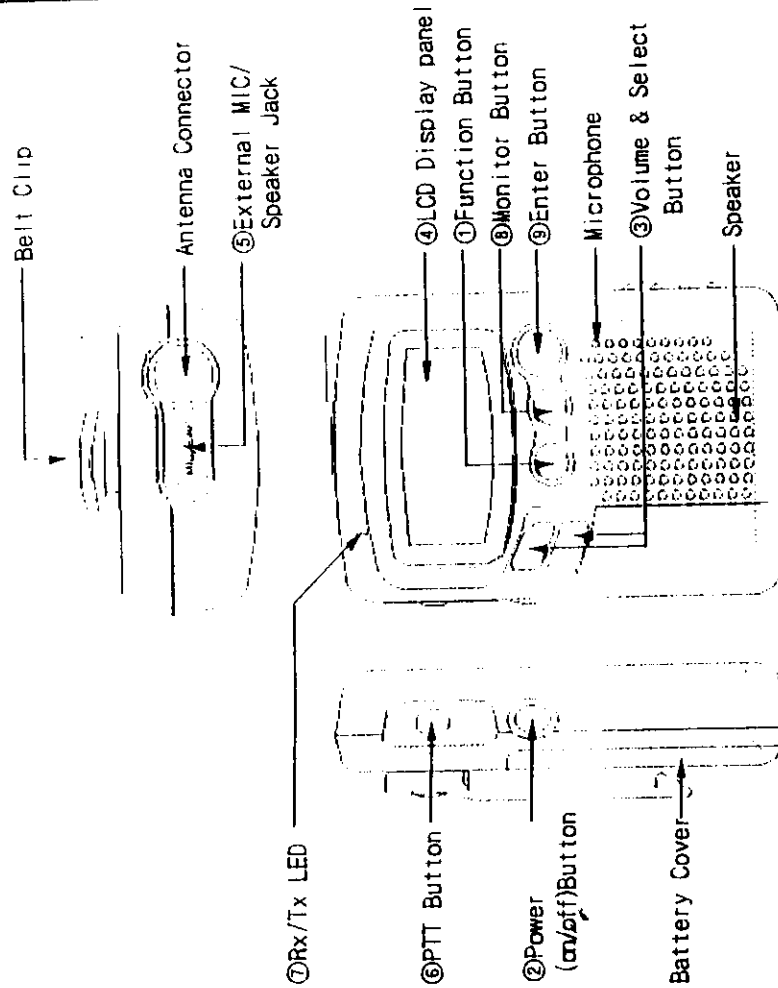
LICENSING

FRS radio operators are not required to obtain a FCC license to operate their FRS equipment or provide station identification. Nevertheless, an operator of a FRS radio station is still required to comply with the communication act and with the rules of FRS Radio Operation.

FRS CHANNEL FREQUENCY TABLE

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	462.5625	8	467.5625
2	462.5875	9	467.5875
3	462.6125	10	467.6125
4	462.6375	11	467.6375
5	462.6625	12	467.6625
6	462.6875	13	467.6875
7	462.7125	14	467.7125

> DESCRIPTION



① Function Button (F)

Press to change function in order as below ;

Channel Selection → Sub-Tone Selection →

→ Scan → Button Lock → Beep Sound →

Priority Scan

If you don't press any key in 5 seconds or press (PTT) button in function mode, your transceiver will be out of function mode.

② Power (ON/OFF) Button (PWR)

Press 0.5 second to turn on, Press 0.5 second again to turn off. When you turn power on, the transceiver makes melody sound.

③ Volume & Select Button (▲▼)

Press ▲ to increase the volume, Press ▼ to reduce the volume in 16 levels.

And you can select option in function mode with this button.

④ LCD display Panel

Show the all functions and processing.

⑤ External MIC/ Speaker Jack.

Connect the external MIC, speaker and adaptor using ø 3.5mm audio accessory.

⑥ PTT (Push To Talk) Button (PTT)

Hold down to transmit, release to receive.

⑦ Tx/Rx Indicate LED

Green light appears on transmitting, red light appears on receiving. If the signal doesn't match in using sub-tone, green light blinks.

⑧ Monitor Button (M)

Press to monitor. Holding down over 2 seconds keeps monitoring function on, and press shortly again to release.

⑨ Enter Button (↵)

Press to finish selection

OPERATION

1. Power ON/OFF
Press **(PWR)** button to turn on, Press **(PWR)** button again to turn off, When you turn power on, the transceiver makes melody sound.
2. Transmit
Hold down the **(PTT)** button and talk to MIC. Red light appears on transmitting.
3. Receive
Choose the channel as you desire with the counterpart. Check and adjust the volume and sensitivity. Green light appears on receiving. In case the signal doesn't match in using sub-tone, green light blinks.

DISPLAY

DISPLAY	FUNCTION
SCAN	Scanning
	Beep Sound Selection
	Button Lock
CDCSS	CDCSS Sub-tone
CTCSS	CTCSS Sub-tone
58	Sub-Tone Number
588.000	Channel
	Low Battery Indication
FUN	Function
1 2 3	Priority Scan Setting Channel

1. CHANNEL SELECTION

Press **(F)** button until the channel number blinks on the LCD display panel, then choose the channel using **(▲)** **(▼)** button. If you hold down **(▲)** **(▼)** button, the channel moves fast. Press **(▲)** or **(PTT)** button to finish selection.

2. SUB-TONE SELECTION

Press **(F)** button until the 'CTC' blinks on the LCD display panel, then choose sub-tone number(CTCSS 1~38, CDCSS 1~83) using **(▲)** **(▼)** button, Press **(▲)** button to finish selection. Each channel can have all sub-tone separately.

3. SCAN

Press **(F)** button until 'SCAN' blinks on LCD display panel, then press **(▲)** button to upward scan, press **(▼)** button to downward scan, Your transceiver stops scanning after detecting a signal and remains on the same channel until the signal drops out for 2 seconds. Press **(▲)** **(▼)** button to go on scanning even if it remains on the same channel for receiving.

Pressing **(▲)** button in scan mode make SCAN stop and go back to prior channel.

If you press **(PTT)** button during scanning, your transceiver transmit in prior channel. If you press **(PTT)** button during receiving in SCAN mode, your transceiver transmit on present channel.

4. PRIORITY SCAN

Press **(F)** button until "PSCAN" appears and "1" blinks on the LCD display panel, then select 'ON' or 'OFF' using **(▲)** **(▼)** button. Press **(▲)** button to finish selection. When you select 'ON', the channel number blinks. Use **(▲)** **(▼)** button to select the channel and Press **(▲)** button to finish setting. As you finish setting "1", "2" blinks. You can set "2", "3" in same way.

Press **(▲)** button, if you don't want to set.

5. BUTTON LOCK

Press **(F)** button until " " blinks on the LCD display panel, then select 'ON' or 'OFF' using **(▲)** **(▼)** button. Press **(▲)** button to finish selection.

6. BEEP SOUND

Press **(F)** button until "5" blinks on the LCD display panel, then select 'ON' or 'OFF' using **(▲)** **(▼)** button. Press **(▲)** button to finish selection.

APPENDIX 6
TRANSMITTER ALIGNMENT

ONE (1) PAGE ALIGNMENT PROCEDURE FOLLOWS THIS SHEET

TRANSMITTER TUNE-UP PROCEDURE
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APPENDIX 6

TRANSMITTER ALIGNMENT

The radio needs to be disassembled before any alignment could be conducted:

Text from the Technical Manual:

a) Disassembling the unit

The Cover

- Unlock the battery compartment by flipping the cover lock clip.
- Open and remove the battery compartment cover.
- Remove batteries in the battery compartment.
- Remove the 4 screws on the side of the battery compartment.
- The case could then be opened for servicing.
- Be careful not to break the rubber button assemblies and the LCD screen.

The PCBs

- The radio consists of two PCBs, the RF (smaller) and control board (larger).
- A 16-pin connector (CON1) joins the two PCBs. Open up the two PCBs by separating the jack and socket of CON1. Replace CON1 with test cable and lay the two PCBs flat on the workbench with Electrostatic Protection.
- On the RF Board, disconnect the antenna, connect ANT1 to a signal generator or RF power meter.
- On the Control Board, connect Power Supply to the battery terminal contacts.
- Connect External Speaker Mic Plug (or Audio Test Jig) to J501.

b) Transmitter Circuit Adjustment

- TCXO frequency

On receiving mode, check TCXO output (pin 2) is at 12.8MHz

- VCO control voltage

Set radio to receive on Ch1 (462.5625MHz), adjust L402 for 1.8V on test point "VT".

- Transmitter Frequency

Connect RF Power meter to ANT1, Activate PTT to transmit on Ch1 (462.5625MHz) check transmitting frequency error is within +/- 250Hz.

- Transmitter Output Power

Activate PTT to transmit on CH1, Set VR201 for 500mW power output at ANT1. Repeat test on Ch14.

- Transmitter Sub-Audible Tone Deviation

Set radio to transmit on CH1, with CTCSS code 28 (162.2Hz) and no audio modulation. Adjust VR502 for 0.3KHz deviation. Repeat test on Ch14

- Transmitter Deviation Limit

Set radio to transmit on CH1, with CTCSS code 28 (162.2Hz) and no audio modulation. At the external microphone input, inject 1KHz tone at -20dBm. Adjust VR501 for 2.0KHz deviation. Reduce 1KHz tone input to -40dBm, check deviation dropped to 1.2 to 1.5KHz. Repeat test on Ch14.

APPENDIX 7

CIRCUITS AND DEVICES TO STABILIZE FREQUENCY

FOLLOWS THIS SHEET

CIRCUITS AND DEVICES TO
STABILIZE FREQUENCY
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APPENDIX 7

CIRCUITS AND DEVICES TO STABILIZE FREQUENCY

The operating frequency of the radio is generated by a Voltage Controlled Oscillator (VCO) controlled by a Phase Locked Loop (PLL) circuit. The reference frequency of the PLL comes from a 12.8MHz Temperature Compensated Crystal Oscillator TCXO and locks the VCO output to a frequency stability of ± 2.5 ppm within the operating temperature range.

Q401 is a Colpitts oscillator. L402 together with C402, C416, VC Diodes D401 and D403 formed the tuning circuit for the VCO. The phase detector output from PLL U301 pin 6 passes through a loop filter C310, C311/R306 and C312/R307/R308 to provides the tuning voltage for the VC diode D401. FM Modulation is generated by applying audio voltage to VC Diode D403.

Q402 provides an active load to Q401 and buffers the VCO output. The output from collector of Q402 is routed to 1) the frequency feedback input of PLL U301 pin 10, and 2) to another buffer stage Q403 to drive the TX power amplifiers and the RX 1st mixer.

Text from the Technical Manual:

a) Phase Locked Loop (PLL) Circuit

The Temperature Compensated Crystal Oscillator (TCXO)(X301), PLL IC (U301) and the varicap diode Voltage Controlled Oscillator (VCO) (Q401/Q402/D401/D403) are the main components generating the correct FRS channels for the FR460.

The reference frequency of the PLL is provided by the 12.8MHz TCXO, the division ratio is supplied by CPU (U506) through the SYNC_DT line. The phase detector output (DO) is filtered and drives the Varicap Diode D401 to generate the FRS channel frequency being selected by the CPU. The VCO output is buffered by Q403 and sent to TX or RX circuits via diode switch D404.

Normal FM Modulation is achieved by feeding voice signals (S_MOD) to the Varicap Diode D403 VCO circuit. VR501 sets the maximum deviation level.

Sub audible signaling (CTCSS or DCS) are generated by the U505 and is fed to the TCXO for low deviation modulation. VR502 sets the signaling deviation level.

In the case of PLL out of lock, the SYN_LD line will become active to inform the CPU to shut off the transmitter. This ensures the radio only operates on the correct frequencies.

b) Transmitter

The transmitter operates on the 14 FCC approved FRS channels generated directly from the PLL VCO. See the Frequency Table for details.

c) Receiver

The PLL VCO output feeds the first mixer in the dual conversion receiver. The VCO frequency is 21.4MHz lower than the transmitter frequency. A diode switch D402 is used to switch in C403 to correct the tuning range of the VCO.

APPENDIX 8

CIRCUITS TO SUPPRESS SPURIOUS RADIATION
AND LIMIT MODULATION

FOLLOWS THIS SHEET

CIRCUITS TO SUPPRESS SPURIOUS
RADIATION AND LIMIT MODULATION

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APPENDIX 8

CIRCUITS TO SUPPRESS SPURIOUS RADIATION AND LIMIT MODULATION

1) Circuits to suppress spurious radiation and harmonics

In order to achieve the Spurious and Harmonics Specification of -55dBc , The transmitting signal, after being amplified by the transmitter final stage Q201 is fed to a series of low pass filters before entering the antenna for transmission:

- a) One stage "L" type low pass filter L202/C203 prior to the antenna switching diode D201.
- b) Two stages of "L" and "C" type harmonic filter L108, L102, C104 and C102 between antenna switching diode and the antenna.
- c) L1 and C101 provides better impedance matching to the short antenna, and reduces spurious emission.

2) Circuits to Limit Modulation

The quad operational amplifier U504 provides the necessary signal processing for the audio signal from microphone:

U504C (pins 8/9/10) is a simple microphone amplifier.

U504B (pins 5/6/7) together with C534/R534 formed a 6dB/Oct Pre-Emphasizing Circuit.

U504A (pins 1/2/3) is a splatter filter for the pre-emphasized audio signal.

U504D (pins 12/13/14) is an additional splatter filter for audio and audible tone signaling. (NOTE: Tone signaling is not available in FR460, R556 is removed from the circuit)

The output of U504(D) is connected to VR501 for the adjustment of maximum deviation level to the VCO FM modulator circuit.

During transmitter alignment, a -20dBm signal is used to overdrive U504, and the deviation is adjusted to 2.0KHz maximum.

When a normal microphone, with maximum output of around -40dBm is used with the radio, a deviation level of 1.2-1.5KHz can be expected.