Ultra-Miniature 24 Bit SDR





Portable HF SDR Transceiver



Operation manual

V1.01.00 April 2019

Basic Features	3
Panel Buttons	4
Front Panel	4-7
Rear Panel	8
Side Panels	8
Connector Pin-Outs	9
MIC Buttons	10
External Power Connection	11-12
LCD Display	13
Power On/Off	14
Bands Selection	15
Operating MODE Selection	16
Volume Adjustment	17
Multi-function Adjustment Knob	18
Adjusting Transmit Power	19
Setting Operation Frequency	20
Automatic Antenna Tuner	21
Function Buttons	22-23
VFO and Split (SPL) Operation	24
CW Transmission	25
SWR Scanner	26
Digital Bandwidth Filter	27
Line Input /Output Selection	28
Channel Memories	29
Setting Boot Screen Callsign	30
System Menu	31

PC Data Comm. Connections	32
System Parameter Settings	32
Computer Control Instructions	33
Band/Voltage Output for Ext. Amp	33
Specifications	34
Packing Items List	35
G90 and XPA125B Connection Diagram	36
CE-19 Expansion Card Interface	37
Copyright Statement	38



The G90 is a portable 20W HF SDR amateur radio transceiver with built-in auto antenna tuner. The display unit and the radio can be separated. It is a new member of the Xiegu product family and the first model of the new "G" series.

The G90 is a 24-bit 48kHz sampling rate SDR. It has excellent TX/RX performance and a highly configurable user interface.

- > High performance front end with narrowband pre-selection filters
- > Covers the frequency range of 0.5~30MHz, SSB/CW/AM/ FM*
- > 1.8 inch high brightness color TFT LCD screen
- > ±24k bandwidth spectrum and waterfall display
- > Software defined RX bandpass filters (CW mode down to 50Hz)
- > Detachable Front display unit
- > Up to 20W RF power output
- > Built-in wide range automatic antenna tuner
- Extensive Input / Output connections
- Baseband I/Q output. Interface with any external device that can handle baseband I/Q, including sound cardbased or PC-based applications.

Please read this manual fully before operation so as to get a good understanding of the G90's capabilities and functions.

*1: The FM mode can only be turned on when the GSOC controller is used together.



- 1 Volume knob
 - Turn to control the speaker volume.
 - Short Press In: Switches to headphone output mode.
- 2 Power/ Receive or transmitting status pilot lamp.
 - Standby/receive status: Yellow-green
 - Transmitting status: Red
- 3 Power switch
 - Press In to boot up & start radio
 - With Radio On: Press In and hold to shut down
- 4 Multi-function adjustment Knob
 - Default state: Turning this knob will step at 100 kHz.

- Press and hold this knob to select Custom Functions.
- $5{\sim}6$ Mode switching
 - TX/RX Mode switching
- 7~8 BAND Switching Change Bands
- 9 FUNC Indicator light

When the function button is pressed, this LED will light yellow to indicate you are using the alternate functions of the other control buttons.

10 \triangle F Indicator light

This LED will light yellow when you have CW tuned into the correct pitch. It will blink in sync with the incoming CW characters.

11 Main Knob

Operating this knob will change the current frequency. (VFO)

Function buttons:

- 12. TUNE: Antenna Tuner on/off and set.
- 13. Po: Transmitter power output adjust
- 14. KEY: CW speed, QSK, key type and ratio
- 15. LOCK: Lock button controls





16. Headphone interface (On the left side of the control head)

This 3.5mm stereo jack (3-pin) for connecting standard headphones.

17. Communication interface (On the left side of the control head)

This 3.5mm jack is currently used for updating the control head's internal firmware. The programming cable is included with the radio's accessories. The Firmware update files and TerraTerm program used to update the G90 are available on the Xiegu website. It may also be used for CAT control of the G90. Other uses for this port may be implemented in future firmware updates.

18. MIC Interface (On the right side of the control head) Connecting the multi-function MIC to this connector.



19. Antenna interface

SQ-239 type. Impedance 50Ω

20. KEY interface

The interface is a 3.5mm stereo jack for connection to manual/automatic CW keys. CW key connection diagram:

da

For manual CW keys: Connect Dit and Dash together.



21. COMM interface

Firmware Expandable I/O connection. Currently used for main unit Firmware updates.

22. I/Q Signal output

The interface is a 3.5mm stereo jack for "I/Q" signal output.

23. ACC

The interface is an 8-pin mini DIN interface. Pinout is shown in the connector description.

- 24. DC Power Cable Connector
- 25. Ground Terminal Connection



Rear Panel



2, COMM Connector

MICE

MIC

GND

MDATA



3. Headphone Interface



5、CW Key Wiring Diagram



MIC Buttons

|--|

2、PTT

3、UP / DOWN

4、RX/TX indicator

5、Numeric keypad

6、FIL

7、MODE

8、Function indicator

9、Function button

10、MW

11、V/M

12、XFC

13、TUNER

Lock button

Transmit control button Frequency "+" or "-" buttons

Hand Mic operation indicator

Numeric keypad area

Filter selection

RX/TX operation mode

tor LED

F1/F2-configurable settings

Memory Storage operation

Frequency/channel switching

Actual TX Freq Select (Split)

Hold press to turn on the built-in automatic antenna tuner for tuning.



The G90 can use a 13.8V external DC power supply. The DC power supply must have a current load capacity of at least 10A. 13.8-14.3 VDC required for 20 watts output. The supplied power cord can be used to connect radio and your DC power.

When connecting the DC power supply - please be very careful to observe the connections to avoid reverse polarity! The red wire is connected to the positive pole of the power supply, and the black wire is connected to the negative pole of the power supply.



When you use an external power supply, in order to prevent external interference from entering the radio through the power line or the radio radiating RF out of the power line, use a clamp-on or loop-through Ferrite choke. Place it as close to the radio's power connector as possible.



- When using an external power supply, carefully check the polarity of the power cord and do not reverse the polarity.
- The limited warranty of this radio does not include damage caused by an external power Radioddity.cor connection error or damage caused by improper power supply voltage.

Many of the G90's buttons have dual functions. Main functions are accessed by a short press and alternate functions are accessed by a long-press of the control button. All the functions states and values are reported through the 1.8" color LCD screen.

Interface display as follows:



Turn on/off Transceiver

- 1、Turn on: press PWR 🕑 button.
- 2、Turn off: Power on state, Hold press Ubutton 1 second.

To turn OFF LCD screen (save batt power):

When the G90 is ON, quickly tap the main PWRPower buttonbutton and the LCD screen will power off.The radio will remain ON. Hit any button on theradio to turn the LCD screen back ON. Tap theLOCK button and the LCD will step throughdifferent brightness levels.



Operating frequency band selection

The G90's frequency range covers 0.5 to 30 MHz. Amateur frequencies within this range are divided into 10 bands. Band switching can be performed in a number of different ways. SW bands are included.



To Change Operating Band:

Press the **BAND <** or **>** button. This will increment or decrement through the Ham bands.



Each amateur band has a user-defined frequency range associated with it.

The radio will be configured to allow 60 meter band operation if your country permits it.

VFO-A and VFO-B are two independent VFO's that can be set independently.

Operating mode select

Pressing the [**MODE**] button increments through the available operating modes.





VOLUME CONTROL

Speaker mode:

Rotate the volume knob left or right to adjust the level of received volume.

Headphone mode:

- Press the volume knob inwards momentarily to enter headphone mode and mute the speaker.
- > Rotate the volume knob left or right to

VOX mode on / off:

Press and hold the [FUNC] button for over 1 second.

Press the volume knob briefly to enter the VOX function settings.

VOX menu description:

VOX OFF/ON: VOX function off/on

- VOX GAIN: Voice Control Gain Setting
- ANTI-VOX: Hand mic speaker noise-trip suppression setting
- VOX DLY: VOX hold delay setting

The voice control function can be enabled for both the hand microphone and the line input LINE.



Multi-function adjustment knob

This is handy for use when you only connect the RX and TX audio lines to the Acc.

This will Key the G90's TX key the radio automatically using digital modes. (no CAT required)

When using the AF IN port of the ACC interface for line input audio, set the appropriate input volume level in the system menu.

This will have an effect on the VOX level setting- so set it first.

Multi-function adjustment knob

The multi-function knob controls many of the radios functions and settings

Operation method:

Default: VFO tuning in 100 kHz frequency increments.

Short press: Enter SQL item to adjust SQL level.

Hold press: Goes to the User Custom feature menu.

Rotate the main knob to select the appropriate item.

Short press the "SAVE" key to select that menu item.

At this point, the featured item is adjusted by the multi-function adjustment knob.

The Save and Exit buttons are the first two under the LCD. Save = PRE Exit = COMP



- The customizable features are as follows:
- 1) Frequency steps
- 2) SQL Level
- 3) Po Level, transmit power setting
- 4) Key Speed, automatic key rate setting
- 5) FFT Scale spectrum reference level setting

Adjustment transmitting Power Output (Po)

Operation method:

- 1、 Short press the [Po] button to set.
- $2\,{\scriptstyle \ensuremath{\scriptstyle \sim}}$ $\,$ Then use the multi-function knob $\,$ to $\,$

set the output power in 1W

increments.

Multi-function Adjustment — Knob



*When using the G90 transceiver for the first time without knowing for sure your antenna has a low SWR, minimize the set transmit power output.

Set the operating frequency

There are **three ways** to set the G90 operating frequency. You can use the large main tuning knob, the multi-function knob and the microphone.

- 1. Set the tuning steps using the main knob
- Short press the main knob, select 100Hz, 1kHz, 10kHz steps.
- Rotate the main knob to set the frequency of the current step.



Main Knob

- 2. Rotate the Multi-function knob 100khz increments
- 3. Set the frequency manually using the microphone:
 - Press the [F-INP ENT] button on the microphone. The G90 enters the frequency setting state. The cursor will blink in the first position on the left side of the frequency display.
 - Enter the frequency values you want to set, and then press the [F-INP ENT] button again to complete the frequency setting.

For example, set the current frequency to 14.09000MHz, and the key order is as follows:

- 1. First press the [F-INP ENT] button;
- 2. Press the 1 4 . 0 9 0 0 0 number key in sequence;
- 3. Press the [F-INP ENT] button again, complete the setup.

Automatic Antenna Tuner

This G90 has a high-efficiency automatic antenna tuner that can help you quickly set up your antenna.

- A short press of the [TUNE] button will activate the built-in antenna tuner. The "TUNE" logo will be displayed at the top of the screen. (tuner in-line)
- Press the [TUNE] button for 1 second and the tuner will attempt to tune the connected antenna. TheG90 will return to RX mode when tuning is complete.



Note:

- 1. Press the [TUNE] button and the antenna icon appears at the top of the screen to indicate that the automatic antenna tuner function is turned on. The ATU is ready- but the automatic antenna tuning has not been initiated yet.
- 2. If you start a transmission and the SWR icon on the top of the screen is blinking, the ATU needs to be used because the SWR is high.
- 3. Long-press the ATU button to activate the auto-tune function. If it is successful (can tune the antenna you are using) the antenna icon on the top will not blink during transmissions.
- 4. When using a whip antenna and turning on the built-in antenna tuner for tuning, it is possible to cause strong RF interference to nearby electronic devices.

Function button

The G90's common functions are distributed on the various function keys. Some function keys have a second function. When the function is selected, turn the main knob to adjust the value.

Operation of the second function:

- Press the [FUNC] button at first, the "F" indicator will light, then press the corresponding function button.
- Press the [FUNC] button again to exit the second function. At this time, the "F" indicator is off.



In any function (including the second function of FUNC), press the main knob inwards to exit and return to the main interface

Button function table

Button	Func1 (press, cycle)	Func 2 (FUNC+)	Hold press
PRE/ATT	PREATTNormal		/
CMP/F-L	Turn on transmit voice compression	Digital filter F-L low-end frequency selection	/
NB/F-H	Turn on Noise Blanker - on/off, Level, Width	Digital filter F-H high-end frequency selection	/
AGC/SPL	AGC off、AGC-S、AGC-F、AGC-Auto	Turn on split frequency transceiver operation mode	/
VM.	Switch VFO / Memory	To be determined	/
MW/MC	Turn on channel storage	Turn on channel clear mode	/
A/B.A>B	Switch between VFO-A and VFO-B	Copy the current VFO to the background VFO	/
TUNE	Turn on/off the auto antenna tuner	/	Start antenna tuner tuning
	POWER Transmit power setting	MIC GAIN MIC gain setting	/
FOW	SWR THR Standing wave protection threshold	INPUT Voice input selection	/
	SPEED CW key speed setting	CW Volume Side-tone volume setting	/
	M/L/R Manual/automatic left and right mode switching	CW TONE Side-tone frequency setting	6
KEY	MODE iambic A/B Mode switching	/	
	QSK CW Break-In On/Off	/	
	QSK Time CW QSK Hold Time Setting	/	/
LOCK	5-level screen backlight brightness setting	SCALE Spectrum reference level setting	Lock button,

Split frequency operation SPL and VFO A/B settings

There are two independent VFOs inside the G90 transceiver. We can set different frequencies and modes separately. With the SPL function, you can set up independent TX and RX frequencies.

VFO setting:

- Press the [A/B / A>B] button to switch between VFO-A and VFO-B.
- 2 Each VFO has independent operating frequency, mode and other settings.



Split frequency transceiver SPL operation:

- 1. Set the receiving frequency and mode (VFO-A) first;
- 2. Then setting the transmit frequency and mode (VFO-B);
- 3. Operate the second function of the [AGC/SPL] button.

• You can make full use of VFOA/B to set different frequencies or modes, and switch between two frequency points in real time.

CW communication

Operate with a straight key or paddles of common types.

Operation method:

- 1. Insert the key body (three-wire) plug into the KEY interface;
- 2 Press the [MODE] button to switch the mode to CW (or CWR);
- 3 Press the [Key] button and set the QSK ON to initiate CW transmission
- 4 Press the [Key] button again to set the QSK hold time if needed

Practice mode:

Remember that if the QSK is set to OFF, the side-tone will still be heard when you use the key or paddles, but the transmitter will not send an RF signal.



Key button

The [KEY] button function contains adjustment items that are commonly used when doing CW communication:: CW SPEED K-R/L lambic A/B QSK ON/OFF

Standing wave ratio scanner

The G90 has an antenna standing wave scanning/plotting function. It will scan and plot the antenna's SWR over several frequency range widths settable by the user.

Operation method :

- 1. Press and hold the [POW] button to start the standing wave plotting function.
- 2. Short press the button corresponding to FAST/SLOW displayed on the screen to select the scanning speed.
- 3. Press the button corresponding to the QUIT displayed on the screen to exit the standing wave scanner.

The function corresponding to the button:

- BW: Corresponding to the [PRE] button
- FAST: Corresponding to the [NB] button

QUIT: Corresponds to the [VM] button

Pressing the BW button will increment through 5 pre-set scanning ranges. 50 KHZ, 300KHZ, 450KHZ, 600Khz, and 700Khz. As you increment from 50Khz to the wider ranges, the sampling increment will increment from 1-5Khz.

• The results of the standing wave scanner are not calibrated to an exact reference and are for relative readings only. For accurate measurement of antenna standing wave data, use a professional antenna analysis device for measurement.

Digital filter

The G90 has a built-in variable digital RX bandwidth filter.

Operation method:

 Press the [FUNC] button to start the second function operation.
Press the [CMP/F-L] button to adjust the lower end of the filter and press the [NB/F-H] to adjust the upper end of the filter.
Use the main tuning knob to make the filter adjustments.
Press the [CMP/F-L] button or [NB/F-H] button again to display the currently numerical bandwidth values on the main LCD.
F-L: Low pass cutoff frequency of the filter.
F-H: High pass start frequency of the filter.
Total Filter bandwidth=(F-L – F-H) Hz)



Line input / output

The G90 has an external line input interface.

Line Input Operations:

- hity.col Input the external audio signal to the corresponding pin of the ACC port (see the interface description section for pin definition).
- Go to [FUNC + POW] second item INPUT and select: LINE
- In the system menu, select: AUX IN VOLUME to set the appropriate INPUT volume.

Line Output Operations:

- In the system menu, select: AUX OUT VOLUME to set the appropriate output volume. zadioddity.com
- NOTE: Line input audio level is ≥200mV MAXIMUM.

28

Channel storage MW - Clearing a Memory Channel

Channel storage:

- 1. In the VFO mode, adjust the required frequency, mode and other parameters;
- 2. Press the [MW/MC] button momentarily and the CH 00 (channel number) character will appear on the screen flashing. Rotate the main knob to select an empty channel. A character E will appear after the channel number, indicating that the channel is empty and can be used.
- 3. Press the [MW/MC] button again to save the current set frequency information to the selected channel.

Using Memory Channels:

- 1. Press the [VM] button on the panel in VFO mode to enter channel memory mode; (alternates VFO/Mem)
- 2. Rotate the main knob to switch to select memory channels. (or use mic up/down buttons)

Clearing a memory channel:

- 1. In channel mode, press [FUNC] then [MW/MC], at which point the channel number starts to flash;
- 2. Turn the main knob to adjust to the channel you want to clear. Press the [MW/MC] button again to clear the selected channel.

G90 boot screen call sign setting - CALL SIGN EDITOR

The G90 can display your call sign on the boot-up screen.

Operating method:

- 1. Press and hold the [VM] button to enter the text editor.
- 2. At the bottom of the screen is the character selection area. Rotate the main knob to select the desired character. Short press the main knob inwards to select the character.
- 3. Press the button corresponding to BACK to delete the last character; press the button corresponding to QUIT to exit the editor interface; press the button corresponding to SAVE to save and exit the editor interface.
- 4. When you turn it on again, the edited text information will be displayed on the screen. zadioddity.con

The relationship between functions and buttons: SAVE: Corresponding to the [PRE] button BACK: Corresponding to the [NB] button QUIT: Corresponds to the [VM] button

System menu description

e various menu function	s are defined as follows:			
Serial number	Menu name	Function Description		
1	Mic up/down	Hand mic up/down button function setting		
2	Handle F1	Hand mic F1 button function setting		
3 Handle F2		Hand mic F2 button function setting		
4 LCD BL		Screen backlight brightness setting		
5 AUX IN Volume		ACC port input audio volume setting		
6	AUX OUT Volume	ACC port output audio volume setting		
7	Version	Current firmware version number		

Radioddity.com

Connect to a computer for amateur radio data communication

The G90 transceiver can be connected to a computer to perform various data communication with the corresponding computer software.

Operation connection method:

1. Go to the Xiequ website and download the data cable driver. Install it on your PC. Then Insert the provided data cable into the (communication) port on the left side of the machine head and then plug it into the computer's USB port. This provides your CAT control line.

2. Connect the G90's audio output signal (AF OUT pin of the ACC port) to the computer's audio input port. The #6 item of the system menu can adjust the volume of the output signal.

3. Connect the audio output signal of the computer to the audio input port of the G90 (AF IN pin of the ACC port). The #5 item of the system menu can adjust the volume of the input signal. (*see below)

4. Set the G90 to line input mode (see "Line Input, Output" setting).

5. Set your USB port's speed and bits to match the G90 using the Device Manager.

6. Set your PC software (Fldigi, WSJTX etc) to match the same bits and speed.

*Please use good grounding on the radio and PC. It's good practice to install a clamp-on ferrite choke to the data and audio cables and install it as close as possible to the radio. The level of the output signal of the radio and the level of the output signal of the computer should be adjusted to avoid overloading. For TX audio in, a good method is to set the radio to 20W output power and then adjust your PC's audio output level for just under 10 watts out (mid-scale). Most digital modes are 100% duty-cycle. This method will avoid over-heating the final transistors and provide the cleanest digital signal. The finals are thermally protected, but use good 230100 operating procedure shown above.

PC control instructions

The G90 uses the standard CIV instruction set. You can use the standard commands of this instruction set to remotely control the transceiver. It can also be used to configure the control instructions of other software to control the G90. To get going rapidly, you can use the configuration file for another radio that uses the standard instruction set. Check the Xiegu forum for the latest suggested compatible radio configuration files to try. (IE: IC-817 / IC-7000)

Band voltage data

The G90's ACC port provides a band data voltage output for each band. The band data can control peripheral to automatically switch the band or share the band information with other devices. (IE: the XPA-125 amp)

Band	Voltage	Band	Voltage	Band	Voltage	Band	Voltage	
1.8MHz	230mV	7MHz	920mV	18MHz	1610mV	28MHz	2300mV	
3.5MHz	460mV	10MHz	1150mV	21MHz	1840mV	/	/	
5.0MHz	690mV	14MHz	1380mV	24MHz	2070mV	/	/	

General Specifications:

receive: 0.5MHz~30MHz Frequency Range: transmitting: 160M~10M (Amateur radio band only) Transmitting modes: A1A(CW), A3E(AM), J3E(USB/LSB) Minimum Frequency step: 10Hz Antenna impedance: 500 Range of operating temperature: $-10^{\circ}C \sim +50^{\circ}C$ Frequency stability: ±10 ppm for 10 to 60 min > power up 25°C: 1ppm/h Voltage: 9-15V DC, Negative ground Electric current: receive: 500mA Max transmitting: 8A Max Case size: 120*45*210mm (W * H * L) (Without handles) Weight: About 1.63kg / 3.6 lbs. (body only) Transmitter Specifications: RF output power: 20W (SSB/CW/FM) 5W (AM Carrier) 13.8VDC Modulation type: **Digital modulation** Stray radiation suppression: ≥50dB ≥40dB Carrier suppression: 200~10k (conventional 600 Ω) Mic impedance:

Receiver Specifications:Circuit type:Mixer SDR 24 bit 48khzAdjacent channel suppression:≥60dBSideband suppression:≥60dB

Sensitivity:

1	SSB/CW/FM	AM
0.5~1.79999MHz	/	10uV
$1.8{\sim}1.9999$ MHz	0.35uV	10uV
$2.0{\sim}27.9999$ MHz	0.25uV	2uV
28~30MHz	0.25uV	2uV

(PRE=on, ATT=off, NB=off, NR=off, SSB/CW/AM = 10dB S/N, FM = 12dB SINAD)

Receiver Specifications continued:

 $\begin{array}{ll} \mbox{Image rejection}: & 70 \mbox{dB} \\ \mbox{IF suppression}: & 60 \mbox{dB} \\ \mbox{Audio output}: & 0.5 \mbox{W} & (8 \Omega, \leq 10\% \mbox{THD}) \\ \mbox{Audio output impedance: } & 4 \sim 16 \mbox{\Omega} \\ \end{array}$

- Specifications may change with future revisions.
- The operating frequency range of the transceiver will vary with the machine version, please consult your dealer.
- 60 meters is included if your country permits it's use.

Packing List

Packing List	
Item name	Quantity
G90	1pcs
Multi-function handle	1pcs
Data cable	1pcs
Power cable	1pcs
Remote head DB-9 cable	1 pcs
Operation Manual	1pcs
Warranty Card	1pcs
Fixed stud	2pcs
Hexagon screwdriver	1pcs
Certificate	1pcs

* Optional accessories

Item name	Description
CE-19	ACC expansion adapter
XPA125B	100W power amplifier (with built-in antenna adjuster)
GSOC*1	large screen controller

*1 The GSOC controller is expected to be available in 2019.



*note: The 8-wire ACC control line is provided in the CE19 kit.

CE-19 expansion adapter interface diagram



- PTT CON PTT signal / BAND signal output port. The PTT signal of this port is completely isolated from the radio.
- TO XPA125B XPA12B dedicated interface.
- AF CON Audio input/output port. The audio output from this port is direct demodulated output with no filtering applied.
- DATA CON Data output port in NFM mode. The two terminals of this port are in parallel and both output the same signal.

All rights reserved 2018

Chongqing Xiegu Technology Co., Ltd. reserves all rights to this manual, and reproduction of any part of this Radiodoity manual is prohibited without permission.

V1.1.00 1010160204-C