This cheat sheet is intended to augment the current G90 user manual (and there are several versions) and reflects the G90's functionality with version 'V1.79b03' of its firmware.

Use the first column to look up the various G90 controls or buttons. Use the second column to look up the G90 supported functions (i.e. RF Gain, VOX, etc.). Also, see the release notes at the very end to get an idea when various features first appeared in the G90 firmware. The prior firmware releases are still available at various Internet sites.

Firmware release V1.79b3 introduced some significant changes in the G90's operation. Please refer to the '**Full release notes for firmware 'V1.79b02 and 3'** section at the very bottom of this file for the Xiegu release notes (somewhat cleaned up by me). The major changes or new features are highlighted in this cheat sheet in yellow like this.

The first 7 pages are the actual cheat sheet. The remaining pages are supporting and reference information.

10/28/22 KE8WO

CONTROLS AND BUTTONS	SUPPORTED FUNCTIONS	NOTES
Power Button	**Power On or Off** **Display Off**	• Longer press to power on the G90 Note: If some program is active using the Comm (CAT) port, please remove the CAT cable before powering on the G90. Else the G90 may not start and look 'dead'. If so, remove power from the G90 and unplug the CAT cable .. then power up the G90 normally. • Longer press to power off • A short press will turn off the G90 display, but the radio continues to operate. A short press or using any other G90 control will restore the display.
"Vol"	**Audio Output Level**	Note: press this control to route the audio signal to headphones or other audio device plugged into the headphone icon jack on the left side of the G90. Note: the headphone output is intended to drive head phones only and not an unpowered external speaker.

Unmarked Lower Left Rotary Control ('MFC')	**MultiFunction Control ('MFC')** used for a variety of purposes. ('MFK' in Xiegu's lingo) **Bandpass Filter Center Frequency and Bandwidth**	There are two DSP bandpass filter graphics that initially are superimposed on the G90 display. Each of the two may be moved to the right or left with their overlap defining the resultant filter. Notes for adjusting the bandpass filter: • The initial and final bandwidth filter is PURPLE in the display. • With the first short press of the MFK you are adjusting the first filter graphic which is RED • With the second short press of the MFK you are adjusting the second filter graphic which is **BLUE** • Rotate the MFK to move the selected filter left or right. Note the **PURPLE** is the actual DSP filter composite bandwidth • As these adjustments are made, the filter bandwidth is **displayed but the filter's center frequency is not** • Adjust them multiple times to get the desired filter characteristics • Long press the MFK to end the filter configuration. The final composite bandpass filter being used is **PURPLE**
	Set MFC Default Action	Long press the MFC to bring up 6 choices that may be selected for basic use when the MFC is rotated: Rotate the tuning control to select the desired choice from the six. Press MFC or the 'CMP' button to save the selection. The choices are: • **100 KHZ frequency step size.** This allows quickly adjusting the received frequency in 100 KHZ steps with the MFC control. This 100 KHZ step size is fixed. This is the initial, default setting for the MFC. Note that you can also just press the tuning control to set the tuning step size to 100 KHZ. • **Squelch level setting**. This brings up the squelch level setting where the MFC control can select the desired squelch setting. If squelch is enabled, there will be a small 'SQL' icon on the display. Pressing the tuning control saves the squelch setting, • **PO Level** … quickly adjust the power output level with the MFC control. Then press the tune control to save the power setting. • **Key Speed** … use the MFC control to set the CW keying speed. Press the tune control to save the setting. • **FFT Scale** … Not changeable .. always 'Auto' • **RF Gain …** thereafter the MFC will be used to set the G90's RF gain from 1 to 100%. Note that a long press of the 'AGC' button also allows access to the RF Gain setting.

Right Unmarked Rotary Control ('Tuning')	This is a multifunction control (**'Tuning**') used for a variety of purposes.
	
	Tuning Step Size
	
	RIT Function
		• The usual use for this control is for tuning the G90's frequency.
		  ○ Rotate it to select the desired frequency.
		  ○ Pressing the control cycles the tuning rate from 10 HZ, 100 HZ, 1 KHZ, 10KHZ and 100 KHZ per **click of the tuning knob. from left to right.**
		  ○ Pressing the FUNC button and then pressing the TUNING control reverses this to be from right to left for the next push of the tuning knob.
		• A long press of this control allows setting up the tuning RIT. Then use the Tuning control to dial in the RIT plus or minus KHZ offset desired. Press the Tuning control to save this value. If RIT is active, a small display of "R-nnn" is added to the display just under the normal signal dBm display. The "nnn" is the +/- RIT offset, in khz.
		• In many other functions being used, a press of the tuning knob will complete the other function

Top 'MODE' and 'BAND' Buttons.	**Mode or Band**	• Use the Mode Left or Right buttons to scroll through the eight supported modes. The two new modes are data modes: U-D; L-D, ○ Each mode has it's own set of default DSP filters.(see the V1.79b03 release notes) • Use the Band Left or Right button to scroll through the ten supported amateur frequency bands. • Note: the band buttons may also be used in the System Menu operation.

FUNC Button	Initiate a **Second Function for other Buttons or Controls**. **System Menu**	• A **short press** turns on the amber LED below the button and initiates the second function by some other button or control. These are detailed below. • A **long press** of this button will bring up the 'System Menu' to allow configuring various aspects of the G90's operation. In each case use the 'VM' button to step through the ten options. When making a change to one of the ten, press the 'CMP' button to save the settings and exit.. Here is a brief overview of the options: 1. **Hand Mic Up / Down button** .. this allows setting the function of the hand held mic's up / down button's. Rotate the tuning control to select from: Freq CH +/-, Band +/-, or Volume +/-. 2. **Hand Mic F1** .. this allows assigning a function to the hand held mic's 'F1' button. Rotate the tuning control to select from PRE/ATT, SPLT (Split operation), NB (noise blanker), COMP (speech compressor), or AGC 3. **Hand Mic F2** .. this allows assigning a function to the hand held mic's 'F2' button. Rotate the tuning control to select from the same choices as shown above for the 'F1' button. 4. **LCD BL** .. rotate the tuning control to specify the desired brightness of the display from 10% to 100%. 5. **AUX IN Volume** .. use the tuning control to specify the desired ACC port's Aux In volume from 0 to 15 (bigger is louder) 6. **AUX OUT Volume** use the tuning control to specify the desired ACC port's Aux Out volume from 0 to 15 (bigger is louder) 7. **RCLK (reference clock) Tune**. Rotate the Tuning Control to select the desired negative or positive value. 8. **Band Stacking Mode**. Select 'Ham Band' or 'Full Band'. 9. **G90 on / off beeping sound**. Select 'Enable' or 'Disable'. 10. **Version** .. displays the G90's current versions of the 'APP' and 'BASE software Note that the top mounted Band Up and Band Down buttons may also be used to step through these 10 choices.
	Factory Reset G90	To complete a factory reset of the G90 press and hold the "FUNC" key and power on the G90. Then press the "PRE" key to confirm the reset or press the "VM" key to cancel the reset.
'MW .MC' Button	**Store VFO's Frequency To Memory** **Clear a Memory location**	• There are memories from 00 to 63 • Press 'MW.MC' • Adjust the Tuning control to select the desired memory channel. • Press 'MW.MC' button again to save the value. • You must use memory 00 first .. there after use any of the memories • Press 'FUNC' then 'MW.MC' to clear a memory • Note that the memory's are not directly tunable.

'TUNE' Button	**Antenna Tuner**	• A short press just enables the tuner to be used. But the actual antenna tuning is not initiated.. so the tuner is at its setting when it last actually completed a tuning action. An antenna icon is turned on in the display when the tuner is active.. • A long press enables the tuner and initiates the tuner to tune the antenna for the current band and frequency. The tuner is left enabled and the antenna icon is turned on in the display. • Note: Beware if the split mode operation is set. Depending on VFO-A and VFO-B frequencies / bands; the tuner may get confused.
'POW' Button	**Output Power Setting** **SWR Curve Scan**	• A short press allows the tuning control to select the desired G90 watts. Then press the tuning control to save the setting. Press the 'POW' button again and use the Tuning control to select the 'SWR THR' SWR Threshold of 1.8 to 3.6. Press the Tuning control to end the sequence. • A long press of the 'POW' button initiates the scan of the current antenna's SWR vs. frequency plot. This scan is of the antenna without the tuner in the circuit. The scan is continuous until halted with the 'VM' button. During the scan the 'PRE' button may be pressed to specify 1 to 5 KHZ as the scan bandwidth step size.
'KEY' Button	**CW Configuration**	• Each short press allows setting the CW keying parameters from this list: Keying speed, M/L/R selection, Mode A or B, QSK on or off, QSK Time or Dot: Dash Ratio, Use the tuning control to set the desired value and the press the tuning control to save the setting. • A long press of the KEY button will change the bottom portion of the display where the G90 will attempt to decode and display the characters as CW is being received. Another long press will turn it off. Note that the CW decoder feature is very sensitive to precise tuning and the current filter settings. When close to being tuned properly the amber LED above the tuning control will blink in time with the CW note.
'LOCK' Button	**Display's Brightness** **Lock G90 buttons and controls.**	• Short presses will cycle the G90's display intensity through five levels of brightness. • A long press will lock the G90's controls and display a lock icon indicating the lock status. Another long press will unlock the G90. All controls and buttons, other than the Lock button, are disabled.
"PRE" Button	**Preamplifier and Attenuator**	Press "PRE" repeatedly to cycle though these settings (see the icon in the display): • "P" the preamp is on, providing a boost of the received signals • 'A' the input signal is attenuated by some amount • No icon … neither the Preamp or attenuator is active.
"CMP" Button	**Speech Compressor**	• The speech compressor functions to somewhat process normal speech frequencies into a narrower band to have the effect of boosting the effective output RF power. • Applicable only in the LSB, USB, NFM or AM modes (including the new digital modes!) • See a microphone like icon when the speech compressor is on
"NB" Button	**Noise Blanker** (Intended for reducing repetitive pulse type noise .. not a general noise reduction)	• Pushing the button multiple times cycles through the following options: • 'NB SW' .. use the tuning control to select On or Off Notice the small icon when on. • 'NB Level' .. use tuning control to select 0 to 10. Lower numbers will tend to mute the receiver. • 'NB Width' .. use tuning control to select 0 to 10. Higher values will tend to mute the receiver. • Press the tuning control to end this process at any point.

"AGC" Button	**AGC - Automated Gain Control**	• There are four possible AGC settings: • 'AGC-F' is a fast AGC response to fast changing signals. • 'AGC-S' is a slower AGC response to changing signals. • 'AGC-A' G90 selects the AGC response time required by the current signals being received. • 'AGC—' is the AGC feature turned off

	RF Gain	• Long press the AGC button.
		• A submenu of 'RF Gain' appears
		• Use the Tuning Control to select the desired RF Gain level of 0% to 100%.
		• Press the Tuning Control to save the selection. The initial value is 50%
		• Notes:
		  ○ The RF Gain may also be assigned to the Multi-Function Control
		  ○ The G90 being an 'SDR' based radio, the RF gain is best used at its smallest setting for the incoming signals to minimize overloading the receiver's front end.

"V/M" Button	**'VFO' mode and "Memory" mode.** **Power On Call Sign**	• Memory mode will display 'CH nn' in the display .. where 'nn' is the memory channel number.. Rotate the main tuning knob to rapidly cycle through any previously stored memory channels. • Direct tuning of a memory channels frequency is not supported. • How to write the contents of a Memory Channel to the VFO so you can tune or adjust the frequency and other parameters: 1. Press the V/M key and choose a stored frequency. 2. Short press the FUNC key 3. Short press the A/B key (writes contents of the MC to VFO - both VFOs) 4. Short press the V/M key (returns to VFO mode) now with MC contents displayed and tunable. • A long press will allow setting a call sign, etc. to briefly appear when powering on the G90.
FUNC Button and then "POW"	**Input Source and Mic Gain**	• See 'Input' ,, use the volume control to select 'Line' (the ACC port) or 'Mic'. • Press 'POW' .. see 'Mic Gain' .. use the Volume control to select the gain from 0 to 20. • Press the volume control to end this selection process. • Note: FW Rx.79B03 does not automatically set the 'Input' / 'output' based on the mode.
FUNC Button and the "KEY"	**CW Side Tone Volume and Frequency**	• 'CW Volume' .. Use the Volume control to select the desired CW side tone volume from 0 to 15. You will hear the level in the speaker as you rotate the Volume control. • Press 'KEY' and then use the Volume control to set the desired side tone frequency. • Press the Key button to end the sequence. Press FUNC to turn it off
FUNC Button and then "LOCK"	**FFT Scale and FFT Averaging**	• Press the FUNC button and then the LOCK button • A SCALE submenu appears. • Scale is Always 'Auto' .. not changeable. • Press 'LOCK' again .. An AVE submenu appears • Use the Tuning control to select the desired FFT averaging count from 1 to 10. (Bigger values slows the waterfall display) • Press the Tuning control to save the value

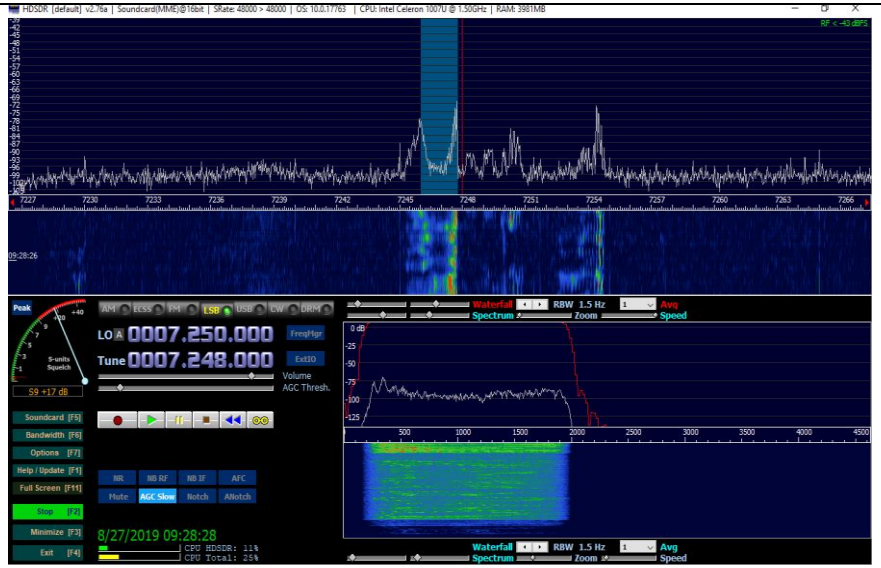
	ALC Meter	The G90 displays an ALC Meter reading from 0 to 100%. This is displayed just under the Power Out Watts near the right side of the display. This is displayed only when the G90 is in transmit mode. Unlike many other radios, a high ALC value, in the 95% to 100% range is desired. Lower readings indicate to the extent that the G90 is cutting back the driving signal (mic or Aux In) to maintain the set power .. possibly distorting the output RF signal. SSB will result in ALC values changing with normal voice variations. AM and NFM will result in a constant, mid-range ALC value.
FUNC Button and then "PRE"/ "ATT" Button	Does nothing	
FUNC Button and then "CMP"/ "F-L"	**Reset bandpass filter 1 to its initial default setting**	• The filter's lower frequency is no longer settable as in the prior FW release.
FUNC Button and then "NB"/ "F-H"	**Reset bandpass filter 2 to its initial default setting**	• The filter's higher frequency is no longer settable as in the prior FW release.
FUNC Button and then "AGC"/ "SPL"	**Split Frequency Operation**	See the current G90 user manual for a good description of how to use this feature. You will see an icon on the left side of the display between the VFO A and VFO B when this split operation is in use. VFO A is the receive frequency and VFO B is the transmit frequency.
FUNC Button and then press the Volume Control	**VOX Configuration**	After pressing this button sequence, the VOX options appear on the display.. The options are: • 'VOX' .. Rotate the Tuning control to select VOX on or off. If on, then a VOX icon appears on the display. Press the Volume control. Or just press the Tuning control to end this VOX set up if you are only turning VOX off or on. • 'VOX Gain' .. Rotate the Volume Control to set the VOX Gain to from 0 to 100. Press Volume • 'ANTI-VOX' .. Rotate the Volume to set the Anti VOX Gain to from 0 to 100. Press Volume • 'VOX DLY' .. Rotate the Volume Control to set the VOX Delay to from 0 to 2 seconds in .1 second increments. Press the Volume control to end the VOX configuration. • VOX is also usable with using AF In via the ACC port.

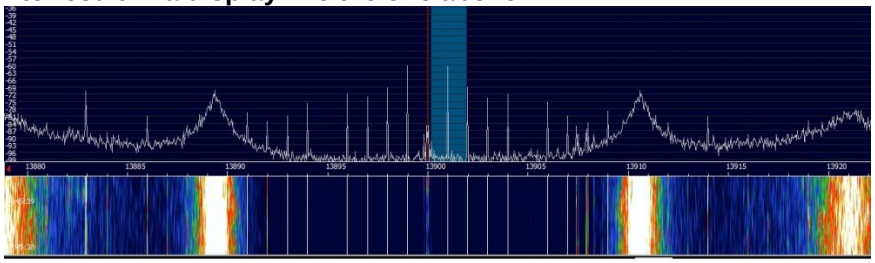
Set up for Digital Modes	**Now that the G90 has been around for a few years, you will find similar information on configuring the G90 for digital and IQ modes on YouTube and various other Internet sources.** **The information presented here is basic and just to get a G90 owner started.**	Notes: • Digital modes require that the audio in and audio out signals to and from the G90 is by way of the rear 'ACC' connector. • Once set up, you may need to adjust 'Aux In' and/or the 'Aux Out' G90 volumes for proper operation. • You may also need to adjust the PC's audio in and/or audio out levels for proper operation. • Some PC interfaces, like the SignaLink USB, has controls to ease this. • In most cases, set up the CAT portion of the digital program being used to specify using the CAT 'PT'T' command to activate the G90's transmit action. Setting up CAT and the G90 for VOX mode is also possible .. But not detailed here. An advantage is that the G90 comm/CAT cable need not be connected. • The G90's side 'CAT' (computer control of the G90) connector and cable implements a subset of the common ICOM CIV communications protocol. The author has had success with these CAT settings far common digital mode programs .. other settings have been found to work by others: ○ WSJT-X: Omnirig (Using IC756Pro) ○ HDSDR: Omnirig (Using IC756Pro) ○ Ham Radio Deluxe: IC7000 ○ Fldigi: Hamlib & X108G ○ Flrig: IC7100 (very noisy on disconnect) ○ JS8Call: Omnirig (Using IC756Pro) • The G90 CAT interface requires a baud rate of 19200 for the computer's serial port. • See the G90 manual for the ACC port Mini-Din 8 pins. Just three pins are used: Aux AF IN. Aux AF Out and Ground • See this YouTube video for comprehensive digital mode set up ideas from OH8STN: https://www.youtube.com/watch?v=xRcHVFRUL4U
Set Audio input as 'Line'	Press 'FUNC' then 'POW'	1. Press 'POW' to display 'Input'. Rotate Main Tuning knob to select 'Line'. 2. Press 'POW' to display 'MIC Gain'. Rotate Main Tuning knob to select desired Mic Gain level 0 to 20. Higher is more gain. 3. Press Rotate Main Tuning knob to complete the set up. Note: Later use these steps to switch Mic back to the handheld Mic as the input to resume voice operations.
Set desired audio 'Aux In Volume'	Press and hold 'FUNC'	1. Press 'V/M' button several times to display '5. Aux In Volume' 2. Rotate Main Tuning knob to select desired Aux In level 0 to 15. Higher is more gain. 3. Press 'CMP' to save the value set 4. Press 'AGC' button to exit
Set desired audio 'Aux Out Volume'	Press and hold 'FUNC'	1. Press 'V/M' button several times to display '6. Aux Out Volume' 2. Rotate Main Tuning knob to select desired Aux Out level 0 to 15. Higher is more gain. 3. Press 'CMP' to save the value set 4. Press 'AGC' button to exit
Set 'USB' mode	Repeatedly press one of the top 'Mode' buttons until USB is selected	USB is typically the mode for data communications.

Turn off the AGC	Repeatedly press the 'AGC' button until you see a display of 'AGC—'	• This is per the recommendations within the WSJT-X user manual: "It is usually best to turn AGC off or reduce the RF gain control to minimize AGC action." This is likely also a good initial setting for other digital modes. • You may need to adjust the RF gain if the audio level seems too loud. You may also need to reduce the AF Out gain setting to avoid over-driving the PC • The different firmware releases acted differently in this regard.
Insure the speech compressor is off	Press the 'CMP' to clear the small microphone icon from the top of the display.	Leaving the compressor on may cause unknown distortions in the data signals being transmitted by the G90.
ALC Meter		Adjust your audio drive signal to achieve an ALC reading in the 95% to 100% range. See the ALC meter item discussed above.
Configure Sound Cards in Windows 10		The following link should be helpful in configuring your sound cards audio in and audio out signal levels. These settings are an important part of getting the proper and workable audio levels from your PC app, WSJT-X, for example, and the G90 ACC ports Audio-In and Audio-Out pins. https://orhelp.osu.edu/support/index.php?/Knowledgebase/Article/View/223/41/How-to-manage-Sound-settings-in-Windows-10 This is one of many links found after Googling "windows 10 configure sound".

Set up for Using the I/Q Port	The I/Q port data stream may be used to reproduce the G90's spectrum and waterfall on an external PC's larger display...	Notes: • The I/Q port on the back panel of the G90 provides a low level baseband output centered on the frequency that the G90 is currently tuned to. • An I/Q output is frequently associated with an SDR based radio, such as the G90. • The G90 I/Q is via the **stereo** 3.5 mm port and is a complex, low level AC signal on the order of 50 or so millivolts or 100 millivolts peak to peak • Depending on the sound card used to sample the IQ signal's sample rate, the spectrum may be at least twice what is seen on the G90's display. • See below for an example PC screen displaying the I/Q frequency spectrum from a G90. • Googling "using G90 IQ data" may turn up related helpful information and videos.
Requirement	Stereo Sound Card Input On Computer	• The I/Q is a two channel signal and hence the computer sound input **must be stereo or two channels as well**. This may be marked as a stereo mic input or line input • Note that most commonly found sound cards, whether it be internal to the computer or an external USB sound card, is a mono, single channel input. If you attempt to use a mono input, you may well get some semblance of it working but the spectrum will likely look like the two sides being a mirror image of each other. • Examples of reported usable lower cost USB sounds that work and have stereo inputs are: ○ StarTech USB Sound Card w/ Stereo Mic – ICUSBAUDIO2D (Amazon $33.95 Jan. 2022) ○ StarTech USB Sound Card w/ Stereo Line Input - ICUSBAUDIO7D) (Amazon $38.99 Jan. 2022) ○ **Of the two, only the StarTech ICUSBAUDIO2D supports 96 KHZ sampling .** The other model is limited to 48 KHZ. **96 KHZ is preferred for the displayed spectrum to be 96 KHZ wide.**
Requirement	Stereo Jumper Cable	• The cable used to connect the G90's back panel I/Q output port to the sound card's input port must be a good quality cable with a stereo 2 channel 3.5 mm male plug on each end.

Requirement	SDR I/Q Program on PC	• The computer must have a program capable of sampling the I/Q data from the sound card and then displaying it on the computer's display.
		• Two known usable computer programs are: "HDSDR" and "SDR#". Each may be found by searching the Internet and you will also find good details on using them. They have a learning curve … beyond the scope of this document.
		• A few key points on these programs usage:
		  ○ Assuming you are using a Windows computer, you will likely need to drill down in the PC's sound settings to see the micro phones advanced settings to select your USB port being used and the 2 channel sample rate desired.
		  ○ Select your sound card and the I/Q as the input signal source for HDSDR or SDR#
		  ○ Select the desired bandwidth / sample rate to be used
		  ○ There are options to set up CAT operation with the G90 to allow tuning syncing both ways
		  ○ Select 'Run' to begin the display
		• A sample rate of 48,000 will yield a spectrum the same width as the G90's front panel display, +/- 24 KHZ
		• A sample rate of 96,000 will yield a spectrum double the width of the G90's front panel display, +/- 48 KHZ or nearly 100 KHZ!
		• Both the HDSDR and SRD# programs are CPU resources intensive .. Especially SDR#. An older, slower PC may get bogged down.

Sample HDSDR Screen With a Good Spectrum	• Using ICUSBAUDIO2D sound card • Sampling at 48 KHZ • G90 tuned to 7250 KHZ and HDSDR also tuned to 7250 KHZ • Receiving a LSB voice signal • G90 CAT cable not connected • A good example of a clean spectrum display.	

Sample HDSDR Screen With Noise	• Same setup as above example • But G90 CAT cable also plugged in to a USB port • Narrow noise pulses spaced exactly every 1 KHZ • Other broad noise pulses are unknown.	Note: Below is an example of a computer spectrum display of the G90 IQ signal. Very noisy. Ferrites on the power supply and signal leads did not help this**. However, an inexpensive stereo Ground Loop Isolator in series with the IQ output and sound card input did remove 95% of this noise for the author to result in a display like the one above** 

The Following G90 Firmware Release History		**The following section shows the Xiegu release notes for each of the G90 firmware releases, beginning with V1.71. These notes, although brief and cryptic in many cases, will show how the various G90 features appeared and/or were modified. Some G90 users may prefer an older FW version**
Full release notes for firmware V1.71		**New Features:** 1.RF GAIN: Long press "AGC" key to access. Rotate main knob to change its value. Note:"RF GAIN" won't affect the S-Meter and FFT Scale. 2.Tuning Steps behavior is changed(from left to right) 3.DSP filter Center/Bandwidth mode Short press USER-Knob(the bottom-left one): Select filter center->Select filter bandwidth->Select USER-define->Loop back When f-center is selected:Title will be "Cxxx"("xxx" is the center freq);a vertical green line showed up at the middle of the orange area When f-bandwidth is selected:Title will be "Bxxx"("xxx" is the bandwidth);two vertical green lines showed up at the both sides of the orange area 4.Reset to factory settings - Press and hold "FUNC" key and turning the rig on to get access. Press "PRE" key to confirm; press "VM" key to cancel 5.Main ref-clock fine tuning - Long press "FUNC" key and entering system menu,at item "7.RCLK Tune:" If this parameter is messed up, just set it to "0",it neither damage the rig nor degrade the performance 6.Band stack mode - Long press "FUNC" key and entering system menu,at item "8.Band Stack Mode:" it can be set as: HAM Band;Full Band 7.Power ON/OFF beeping: Long press "FUNC" key and entering system menu,at item "9.ON/OFF Beep:" it can be set as: Disable;Enable 8.FFT averaging - 2nd function of "LOCK" key, range can be in 1~10 **Fixing and Optimization:** 1.RX audio distortion caused by AGC; also AGC time constant is more longer(approximately,100ms@fast;1000ms@slow) 2.Cant power off when FFT Scale is too small 3.The DSP-filter icon sometimes don't draw correctly 4.2nd function menu behavior(menu or title at the multiple function display area): Main display(DSP-filter icon)->2nd function title1->2nd function title 2->...2nd function title n->Loop back 5.Optimized NB algorithm(by the way, NB is not available any more in AM mode in this version) 6.FFT SCALE can be saved at each band 7.Optimized APC algorithm 8.Optimized High SWR protection algorithm 9.Optimized RF output power detect algorithm(more accurate) 10.AM TX output power is down to 1/4 of the set power 11.Optimized voice comp algorithm

Full release notes for firmware V1.72		1.CW timing is optimized, solved the issue of randomly losing DOT/DASH. 2.T/R switch timing is optimized, faster switching time(t<=53ms). 3.add ALC meter, display below the TX power string when TXing .. it's mainly for digi mode tx ,to get the good linearity, adjust driving level or Line IN volume to make the ALC meter value within 30~90. Max level of Line IN should not be more than 600mVp-p,or it will overload the input amplifier. Note: for digital modes, an ALC reading in the 95 to 100% range is desired. 4.PO meter is optimized, more accuracy. 5.Rotate encoder driver is optimized, less losing of steps. 6.ACC LINE OUT is optimized, Main volume will not effect its output level anymore. 7.ACC Band Volt is optimized, solved the issue of wrong voltage of 12m band. 8.TS max digit change from 10k to 100k when pushing the main knob. 9.RIT function: Press and hold main knob to toggle
Full release notes for firmware V1.73		Official release stable version - Note: Keep both units the same version Change log vs V1.72_build002(Release): 1.Rotary encoder driver has been optimized to be smoother and more accurate (no lost steps). 2.Total RF GAIN = 1/4 RF GAIN setting when AGC is off to prevent sudden volume increase. 3.Rx volume stepping has been optimized 4.MIC GAIN has been lowered to avoid picking up too much background noise. **A favorite firmware version for many users if the following FW improvements are not desired.**
Full release notes for firmware V1.74 'Release'		This update is based on the function of version 1.74-beta, which mainly focuses on optimization with no functions added or deleted. 1. Fixed the problem that MIC Gain is relatively high 2. Added auto FFT scale 3. Added background VFO frequency display function under channel mode 4. Widened the maximum bandwidth of CW filter 5. Optimized the filter bandwidth/center frequency point adjustment and CW Tone adjustment range under CW mode ★If CW Tone is adjusted under CW or CWR mode, the range of CW Tone is the upper and lower limits of filter under current mode ★If CW Tone is not adjusted under CW or CWR mode, the range of CW Tone shall be within the upper and lower limits of filter under CW and CWR mode 6. Changed RF GAIN to directly act on receiving channel gain Adjustment range: 1~100% (default: 50%), corresponding gain (on the basis of receiving channel gain): -19.6~+20dB,step=0.4dB ★Note: RF GAIN will influence the value of Table S and FFT 7. Added microphone filter of SSB mode to attenuate partial low frequency component of microphone signal and improve emission efficiency 8. Changed the color of lines in frequency spectrum picture into green and fill color into semitransparent green 9. Optimized the encoder to prevent it from interference or impulse as the first one 10. Optimized stack and enhanced the stability 11. Optimized the control characteristics of AGC and ALC 12. Fixed the bug of channel storage function 13. Fixed the spectrum display bug during emission 14. Fixed the bug of standing wave detection threshold 15. Fixed the problem of interrupted voice during low power emission

Full release notes for firmware 'V1.75 Final ' Release		1. New System Menu Operation Logic (Select Items Also By pressing Band Up/Down Keys 2. New Multi-Function Knob (MFK) Operation Logic (Long Press MFK to Activate Selection Process). 3. Add RF GAIN to MFK Function List (So RF Gain May Be Always Easily Available). 4. New Filter Center and Bandwidth Logic. 5. NFM Mode Is Available But Just For Testing. Including squelch is enabled. 6. Lower CW Tone Volume (-15dB lower). **Some reported issues by users:** • ATU would often tune the antenna with full 20 watts of power (no matter what the power setting is) • AGC issues
Full release notes for firmware 'V1.76 Final ' Release		**Note: Compatible with head fw version >=1.75 (meaning only the base or main G90 needs updating with v1.76 if the display or head unit is running V1.74 or above)** 1. Set ATU tuning power to ~5W 2. Change AGC time constant: a. Slow mode:~1.2s b. Fast mode:~0.1s 3. Fixed the issue of long AGC recover time(with slow mode) when switching back from tx status 4. Range of SWR extended to 1~10 when combined with GSOC (applies to GSOC only) **Some reported issues by users:** • An audible 'popping' sound when transitioning from transmit to receive in CW or SSB modes. Possibly related to a signal overload (RF gain too high, attenuator not on, etc.) • Some reports of ATU operation not finding as good of a match as V1.75 Final. Perhaps due to the new 5 watt power limit.
Full release notes for firmware 'V1.77'		**Note: Compatible with head fw version >=1.75 (meaning only the base or main G90 needs updating with v1.77 if the display or head unit is running V1.75 or above)** **Latest firmware files: (For clarity, its recommended to just update both the Main and Disp units with their file's below)** G90_MainUnit_FW(stdcm4)_V1.77b2021032101.xgf G90_DispUnit_FW(stdcm3)_V1.77b2021032102.xgf **Release Notes:** 1. Improved the AGC algorithm. 1.1. Improved the isolation of close to channels (increased by about 30dB). 1.2. Eliminated the impact noise of the speaker when switching between receiving and transmitting. 2. When connected to GSOC, all sounds in CW mode will be played by G90 speakers. If the modem function is turned on, the sound still will be played via the GSOC. 3. 1. Compatible with GD MCU and ST MCU. **Note: G90's after the product serial number X04G211600001 must use the firmware version V1.77 (including 1.77V) or later versions. If these later G90's are updated to the firmware version before 1.77V, they may not work normally. Note: this is referring to the G90 production change from the US based 'ST" MCU to the Chinese version "GD' MCU.**

Full release notes for firmware 'V1.78'		**G90_MainUnit_FW_V1.78b2021123101 FW Release Notes DATE 2021.12.31** --- MainUnit: G90_MainUnit_FW_V1.78b2021123101 DispUnit: G90_DispUnit_FW(stdcm3)_V1.77b2021032102 Note: This update only updates the firmware of the Main Unit part. For rig that have not been upgraded to version 1.77b, Be sure to upgrade the MainUnit and DispUnit firmware at the same time. --- Release Notes: 1. Added the receiving audio Modification filter to improve the sound quality and suppress high-frequency noise components. 2. Improved the AGC algorithm to eliminate the spike noise caused by it. 3. Improve the granularity of volume adjustment, the volume value of 0-26 is stepped to 1dB, and the volume value of 27-36 is stepped to 2dB. --- The updated version number is as follows (located in the tenth item of the system menu): BASE: 1.78 Dec 31 2021,11:59:24 APP: 1.77 Mar 21 2021,15:31:07
Full release notes for firmware 'V1.78b01'		**File: G90_MainUnit_FW_V1.78b01** SHA-256: CDAB25C6EEAA9FFF9C9D5C39A2A965F163888DD7913C40FCE75CC913545E4C9A 1. Fine tuning of AGC algorithm to improve audio quality 2. Fix some issues of ALC algorithm 2.1 Tx power more accurate 2.2 Fix the issue that ATU inaccurate or fail to tune due to the instability of ALC algorithm 3. AM tx power equ to set power 4. Display ALC level range 0-100,tips: 4.1 ALC level equ to 0: over driving, decrease input signal level 4.2 ALC level equ to 100: under driving, increase input signal level 4.3 When doing Digi,the audio baseband signals are almost constant amplitude, adjust the soundcard volume to make ALC level between 20-80 to get good linearity 5. Fix a built-in keyer bug(has chances losing dot/dash when performing squeeze operation) **File: G90_DispUnit_FW_V1.78b01** SHA-256: 79B20BD5F6E4705C4EEDB735A16777C1FF5F4D25B1BED088A8FBBAC052D1DC8E 1. Add CI-V command for ATU operation
Full release notes for firmware 'V1.79b02 and 3'		G90_MainUnit_FW_V1.79b02 Firmware Update Instructions: Important Note: The display part/host must be updated to V1.79 simultaneously and the V1.79 cannot be mixed with other versions. File: 1. G90_DispUnit_FW_V1.79b02 2. G90_MainUnit_FW_V1.79b02 1. Improved the AGC algorithm.

2. Improved the Filter's algorithms.

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1. New data mode: U-D; L-D, for USB DIG; LSB DIG,

- In data mode: ACC port LINE IN is connected to the modulator (hand mic is muted); LINE OUT is enabled

2. The bandpass filter is changed to 2 BPFs combination. The default value of each working mode is:

Mode	BPF1	BPF2	Bandwidth
SSB	300 ~ 3000	300 ~ 3000	2700
SSB DIG	100 ~ 3100	100 ~ 3100	3000
CW	-250 ~ 250	-250 ~ 250	500
AM	-3000 ~ 3000	-3000 ~ 3000	6000
NFM	-4500 ~ 4500	- 4500 ~ 4500	9000

Note: Negative numbers for frequency indicate that the frequency is to the left of the center of the spectrum (ie, the lower sideband).

Notes for adjusting the filter:

- The initial and final bandwidth filter is PURPLE
- With the first short press of the MFK you are adjusting the first filter graphic which is RED
- With the second short press of the MFK you are adjusting the second filter graphic which is BLUE
- Rotate the MFK to move the filter left or right. Note the PURPLE is the actual filter composite bandwidth
- As these adjustments are made, the filter bandwidth is displayed but the filter's center frequency is not
- Adjust them multiple times to get the desired filter characteristics
- Long press the MFK to end the filter configuration. The final composite bandwidth filter is PURPLE

When the FUNC light is on:

- Press CMP/F-L key to set BPF1 to the default values (per the above filter list)
- Press NB/F-H to set BPF2 to the default values
- Note: the prior FW releases that supported the filter
- adjustments with these two buttons is no longer available.

Tips:

4. Adjust the operation logic of the secondary menu … Press the FUNC key in the secondary menu without saving and exit
5. FFT SCALE option is fixed to AUTO
6. Optimize the FFT automatic level algorithm, the visual effect is smoother.

Note: The following is the change log associated with FW '**V1.79b03**'
File: G90_DispUnit_Fw_V1.79b03
File: G90_MainUnit_Fw_V1.79b03

Changes (Based on 1.79b01 and 1.79b02 remain, as above):
1. Fix AM/NFM filter issue (This was a major error with the AM mode in 1.79b02)
2. New color map for waterfall