

SPECIFICATIONS

GENERAL	
Frequency coverage	<EUR version> 144.000–146.000, 430.000–440.000, 1240.000–1300.000 MHz <ITR version> 144.000–146.000, 430.000–434.000, 435.000–438.000, 1240.000–1245.000, 1270.000–1298.000 MHz
Mode	SSB, CW, RTTY, AM, FM, DV, DD
Number of memory channels	107 (99 Simplex + 6 Program scan edges + 2 CALL) × 3 bands, 99 (Satellite) - 2500 (DR function)
Antenna connectors	144 MHz SO-239, 430, 1200 MHz Type-N
Power supply requirement	13.8 V DC ±15% (Negative ground)
Power consumption	Tx: Less than 18 A (High power) Rx: 1.2 A typical (Standby), Less than 1.8 A (Maximum audio)
Operating temperature range	-10 °C to +60 °C; 14 °F to 140 °F
Frequency stability	Less than ± 0.5 ppm (-10°C to +60°C; 14°F to 140°F)
Frequency resolution	1 Hz
Dimensions (W x H x D, projections not included)	240 x 94 x 238 mm, 9.4 x 3.7 x 9.4 in
Weight (approximately)	4.7 kg, 10.4 lb

TRANSMITTER			
Output power	<SSB/CW/RTTY/FM/DV/DD>	<AM>	
144 MHz	0.5–100 W	0.125–25 W	
430 MHz	0.5–75 W	0.125–18.75 W	
1200 MHz	0.1–10 W	0.025–2.5 W	
Modulation system	SSB	Digital PSN modulation	
	AM	Digital Low Power modulation	
	FM	Digital Reactance modulation	
	DV/DD	Digital GMSK modulation	
Spurious emissions	<Harmonics>	<Out-of-band emission>	
	144 MHz	Less than -63 dB	Less than -60 dB
	430 MHz	Less than -61.8 dB	Less than -60 dB
	1200 MHz	Less than -53 dB	Less than -50 dB
Carrier suppression	More than 50 dB		
Unwanted sideband	More than 50 dB		
Microphone impedance	600 Ω		

RECEIVER			
Receiver system	144, 430 MHz RF Direct Sampling 1200 MHz Down Conversion IF Sampling		
Intermediate frequency (1200 MHz band)	311–371 MHz (EUR) 311–316, 341–369 MHz (ITR)		
Sensitivity (Preamp: ON, Filter: SOFT)			
SSB/CW (10 dB S/N)	Less than 0.11 µV		
AM (10 dB S/N)	Less than 1.0 µV		
FM (12 dB SINAD)	Less than 0.18 µV		
DV (1% BER) (PN9)	Less than 0.35 µV		
DD (1% BER) (PN9) (1200 MHz only)	Less than 1.59 µV		
Sensitivity for RED version (Preamp: ON, Filter: SOFT)			
SSB/CW (BW: 2.4 kHz)	Less than 0.5 µV		
AM (BW: 4 kHz, 60% modulation)	Less than 1 µV		
FM (BW: 7 kHz, 60% modulation)	Less than 0.5 µV		
Selectivity (Filter: SHARP)	More than	Less than	
SSB (BW=2.4 kHz)	2.4 kHz/-3 dB	3.6 kHz/-60 dB	
CW (BW=500 Hz)	500 Hz/-3 dB	700 Hz/-60 dB	
RTTY (BW=500 Hz)	500 Hz/-3 dB	700 Hz/-60 dB	
AM (BW=6 kHz)	6 kHz/-3 dB	15 kHz/-60 dB	
FM (BW=15 kHz)	12 kHz/-6 dB	20 kHz/-60 dB	
DV (12.5 kHz spacing)	-50 dB	-	
DD (300 kHz spacing)	-40 dB	-	
Spurious and image rejection ratio	144, 430 MHz	1200 MHz	
	SSB/CW	More than 70 dB	More than 50 dB
	AM/FM/DV	More than 60 dB	More than 50 dB
	DD	-	More than 50 dB
Audio output power:	More than 2.0 W (1 kHz, 10% distortion) into an 8 Ω load		

REAR PANEL



- A 144 MHz Antenna Connector
- B 430 MHz Antenna Connector
- C DC Power Socket
- D 1200 MHz Antenna Connector
- E LAN Port
- F 10 MHz Reference Signal Input
- G Accessory Socket
- H Data Jack
- I USB Type B Port
- J CI-V Remote Control Jack
- K KEY Jack
- L External Speaker Jack MAIN
- M External Speaker Jack SUB
- N Ground Terminal

SUPPLIED ACCESSORIES

- HM-219 HAND MICROPHONE
- DC power cable

OPTIONS

HM-219
Hand microphone with UP/DOWN switches (Same as supplied)

SM-50
Dynamic desktop microphone including [UP/DOWN] switches and a low cut function

SP-38
External speaker with high quality audio, matching height (Maximum input: 7 W)

PS-126
DC power supply (13.8 V DC, 25 A maximum output)

RS-BA1 (Version 2)
IP remote control software

RS-MS1A
Remote control application for Android™. Download free from Google Play™.

- SM-30 Compact, lightweight electret desktop microphone
- SP-41 External speaker with two input lines
- SP-35 External speaker (2 m, 6.6 ft cable)
- MB-118 Mobile mounting bracket
- MB-123 Carrying handle
- OPC-2350LU PC/Android™ data cable
- CS-9700 Programming software
- RS-MS3A Terminal/Access point mode application for Android™

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Visually Seize
the VHF/UHF World



High-Speed Real-Time Spectrum Scope, Waterfall Display, and Built-in 1200 MHz! This Supreme VHF/UHF Transceiver Provides a Brand New Experience!



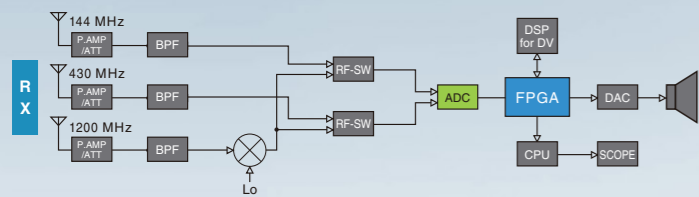
144, 430, 1200 MHz ALL MODE TRANSCEIVER IC-9700

144, 430, and 1200 MHz All Mode Transceiver Including Satellite, DV, and DD Modes

The IC-9700 is an all mode Tri-band transceiver, covering 2 m, 70 cm, and 23 cm. In addition to the traditional SSB, AM, FM, CW, and RTTY modes, the transceiver also incorporates the D-STAR (Digital Smart Technology for Amateur Radio) DV and DD modes. A full featured Satellite mode is built-in! There are three antenna connectors, one each for 144, 430, and 1200 MHz.

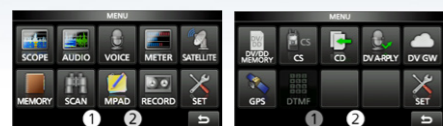
The Icom's Digital Expertise

RF Direct Sampling, for 144 MHz and 430 MHz, is utilized in the IC-9700. For 1200 MHz, the Down Conversion IF Sampling method is adopted. In this system, signals are digitized by the ADC and processed in the FPGA. The signals are processed in the digital domain, thus eliminating distortion and other nonlinear elements seen in the legacy superheterodyne receivers. The outcome is that the signal purity is very high, and clear audio can be generated.



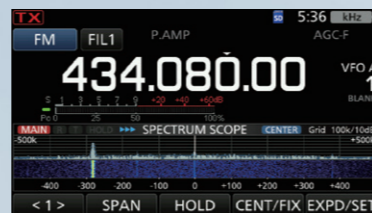
Intuitive Touch Screen Display

The beautifully designed MENU screens enable you to navigate settings and functions with a simple touch. The expanded menu provides quick access to the Satellite and D-STAR functions. Additionally, a touch on-screen keyboard is available for entering alphanumeric memory channel names.



Real-Time Spectrum Scope and Waterfall Display

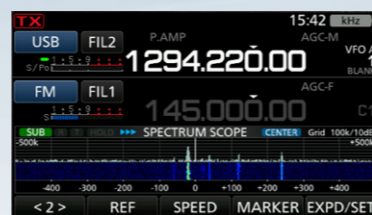
This is the first time for an Icom VHF/UHF transceiver to have a real-time spectrum scope and waterfall display comparable to an HF high tier transceiver. With the high-speed spectrum scope, you can instantly see the operating band condition. With a simple touch of the scope, you can tune the radio to the desired signals frequency. You can also view the receive signal history using the waterfall display.



Example

Independent Receiver, Full Duplex Operation

The IC-9700 can simultaneously receive on two different bands, and two different modes. For example, you can receive on the 1200 MHz band in SSB mode while receiving on the 144 MHz band in FM mode. This function can be a significant advantage when participating in contests or searching for weak signals. Furthermore, the IC-9700 is Full Duplex, which enables you to transmit on the main band while receiving on the sub band.



Example

Audio Scope Function

Making good use of the Audio Scope function, various audio characteristics, such as microphone compressor level, filter width, notch filter width, and keying waveform in CW mode can be monitored. Transmit or receive audio can either be displayed on the FFT scope and the oscilloscope.



Actual size

Newly Designed Power Amplifier

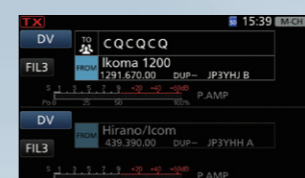
The power amplifier outputs stable power with high efficiency (144/430 MHz band: 100/75 watts). The cooling system prevents the PA from overheating, even when operating for a long time. That ensures reliable operation during contests. This amplifier is more energy efficient than previous models.



This is a comparison between two transceivers' rear chassis temperatures when continuously transmitting for 15 minutes. The IC-910* rises to 65 °C while the IC-9700 rises only to 45 °C. * Japanese version example when testing at 50 W.

D-STAR Operation Friendly Functions

The IC-9700 has the D-STAR Repeater (DR) function that has been well received by D-STAR enthusiasts. The DR function can be used on both the Main and Sub bands simultaneously to listen to two separate DV signals. Moreover, by using the DD mode, you can browse the Internet through a repeater station.



Example

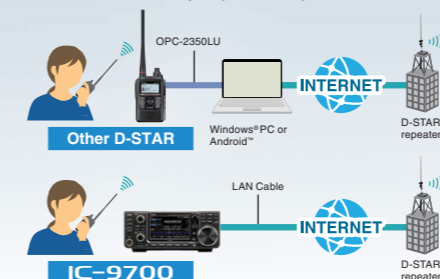
Built-in DV Gateway Functions

A static IP address can be set to the transceiver. If you set a global IP address to your router, you can use the Terminal mode or Access Point mode without any software applications.



Example

Connection example (AP mode)



* These functions can be used only when using through D-STAR G3 repeater.
* See the instruction manual that comes with the transceiver when operating.

Almost Identical User Interface to the IC-7300

The layout of the dials and keys, and the menu screens are almost the same as the IC-7300. If you are familiar with the IC-7300, you can operate the IC-9700 without hesitation. The IC-9700 is the perfect side-by-side companion to the IC-7300, enabling operations from HF to the 1200 MHz.



Comprehensive Menus for Satellite Operation

The IC-9700's Satellite mode makes Satellite operation very easy. Even in Satellite mode, you can use the high-quality spectrum scope.

Normal and Reverse Tracking Functions

In addition to the Reverse Tracking function there is also a Normal Tracking function. Both functions simultaneously increase or decrease both the downlink and uplink frequencies in the same steps.

AFC Function

Automatic Frequency Control follows the frequency change caused by the Doppler effect, thus maintaining a stable receive condition.

Up to 99 Satellite Memory Channels

The IC-9700 has 99 satellite memory channels that enable you to store both uplink and downlink frequencies and operating mode. By just selecting a satellite memory channel, all of your satellite settings are completed.

Other functions

• Loud and clear audio • Compatible with the RS-BA1 Version 2 and CI-V commands • Built-in server function • Digital Twin PBT • CW functions: Full break-in, CW memory keyer, CW reverse, CW auto tuning • SD card slot • TX/RX audio recording • Screen capture...and more.

Using the IC-9700 on the Amateur Satellites

Joe Carcia, NJ1Q
W1AW Station Manager

Those just starting out on amateur radio satellites may have tried the FM birds, such as AO-91, AO-92, or SO-50. You can make contacts on those satellites using a dual-band FM handheld with a simple handheld 2-meter/70-centimeter Yagi. The IC-9700 offers a step up for those wanting to operate through the satellites using CW, SSB, or FM on Mode B (70 centimeters up/2 meters down), Mode J (2 meters up/70 centimeters down), or Mode L (23 centimeters up/70 centimeters down).

The IC-9700 has a dedicated **SATELLITE** mode. To select that mode, bring up the **MENU** display and press the **SATELLITE** icon for 1 second. This will copy the current frequency content to the satellite VFOs. The display will now revert to its **SATELLITE** mode display. The **TX** function drops to the **SUB** (lower) band, and **MAIN**, **NOR/REV**, and **SUB** buttons appear on the display.

Depending on the mode (B, J, L), the proper transmit and receive frequencies should be set first, noting that the **SUB** frequency becomes the **TRANSMIT** frequency in **SATELLITE** mode.

The **SATELLITE** mode allows for manual Doppler correction. When running in **SATELLITE** mode, the user has the option of setting the tracking — a method of adjusting both the transmit and receive frequencies simultaneously with the tuning dial — via the **NOR/REV** button. In **NOR** (normal) mode, both the transmit and receive frequencies change in unison; if the transmit frequency goes up or down (in 10 Hz increments), the receive frequency does the same. In **REV** (reverse) mode, the transmit and receive frequencies change in opposition to each other; if one frequency goes up (in 10 Hz increments), the other frequency will go down accordingly. (Note that radio

control available with some satellite tracking programs may allow for automatic Doppler adjustment.)

If the operator needs to adjust either the **MAIN** or **SUB** frequencies separately, then the corresponding **MAIN** or **SUB** button should be pressed. The button will turn orange, and the corresponding frequency will be underlined. Frequency changes to one VFO will not affect the other. To exit this function, press the button again.

In **SATELLITE** mode, the spectrum scope or audio scope can switch between the main or subbands by touching the **MAIN/SUB** indicator on the scope display.

On the Air

My first attempt at satellite activity was with one of the newer analog birds (Mode J). At first, I found the tracking (in normal mode) to be a little less effective than manually adjusting the uplink frequency myself. With the tracking in reverse, I observed my downlink signal audio kept up well with the uplink signal. However, I was also chasing myself around the band. When I tuned in a station calling CQ, I found that as I corrected for Doppler shift, I'd lose the station, because both frequencies were changing at the same rate. If the other station wasn't changing frequency at the same rate/step as I was, then I tuned right by their signal.

However, because the radio will operate full duplex (transmit on one band and receive on another at the same time), you can just operate without using **SATELLITE** mode and set the satellite transmit and receive frequencies accordingly. I chose to sit on a particular downlink frequency, and manually tune the uplink frequency, so my monitored downlink signal sounded stable. This is not meant to imply the tracking function isn't useful, rather it is a choice I make based on my experience and preferences.

Next up was one of the FM birds (Mode B) — see Figure B. Because the downlink was on 2 meters, I didn't have to worry as much about Doppler (at least for receive), and the IC-9700 has an AFC (auto frequency-control) feature to help compensate for Doppler shift in FM mode. I waited for TCA (time of closest approach) and set the uplink frequency accordingly. My first "CQ satellite" yielded an immediate response back. I proceeded to make two more contacts before the satellite dropped below where my antenna was oriented.

The audio for both SSB and FM was great. Received signals sounded clean and easy to copy, and I also received good signal reports. For both birds, I used an Arrow antenna mounted on a tripod. The antenna was oriented to the various birds' azimuth/elevation coordinates at TCA.

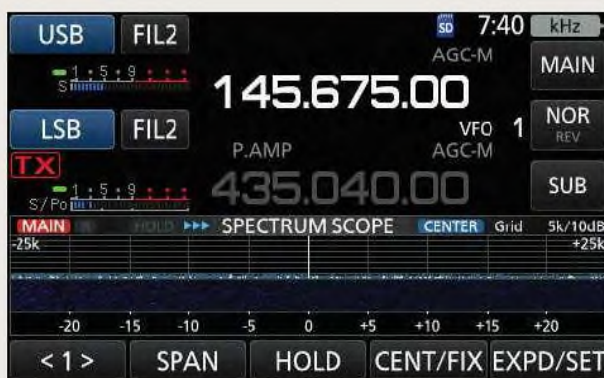


Figure B — The IC-9700 setup for Mode B satellite operation.

repeater with an internet gateway, you can use the DD mode to browse the internet through the repeater. If you set your GPS location coordinates into the radio (manually), you can use the DR mode to find the closest D-STAR repeater, and you can download the full North American list via the Icom website.

The radio's ethernet LAN interface can be configured using a dynamic IP address (DHCP), or you can set a static IP address if you need to do port forwarding for remote or DV gateway operations. That means you can use the radio directly in terminal mode or in access point mode, directly through the internet. Here's an example of the terminal mode. Let's say you are unable to reach a popular repeater located in another state on the air via RF. If the repeater gateway is compatible, you could connect to it via the internet and have a contact with your friends using the radio's mic and speaker — no PC or any extra gear is needed.

You could do exactly the same in access point mode using a D-STAR handheld and a simplex frequency on the IC-9700, so when it receives the RF from the handheld, it will uplink the information to a remote repeater via the internet. In other words, if there's no D-STAR repeater near you but you have an internet connection, you could still operate with D-STAR by using the integrated DV gateway function.

On the Air

I used the IC-9700 with my new antenna setup (see the "Diamond X6000A VHF/UHF Triband Antenna and MX3000N Triplexer" review in the December 2019 issue of *QST*). It outperformed my previous installation, to the point that I don't use the IC-9700's preamp on 2 meters — it's just too much. Compared to a dual-band mobile radio, the IC-9700 can pull weaker signals out of the noise. It's a totally different experience than I am used to, and it feels more like operating an HF radio. With a good antenna up high with 100 W on 2 meters and 75 W on 70 centimeters, I can reach those far away repeaters and can increase my coverage in simplex.

When the IC-9700 was first released, some users discovered that the frequency stability was not adequate for some digital mode operation using moonbounce (EME) or for some terrestrial digital-mode operation at UHF. Since the North American launch in April 2019, Icom has released a number of firmware upgrades, and the frequency stability has improved significantly. As noted in the sidebar, "Using the



Visit <https://youtu.be/7EOPdwd8KK0> to see our review of the Icom IC-9700 VHF/UHF Multimode Transceiver on YouTube.

IC-9700 for VHF/UHF DXing and Contesting," Jeff Klein, K1TEO, had no trouble making SSB, CW, or FT8 contacts on VHF or UHF with version 1.11 firmware installed.

In addition to improving the stability with the internal oscillator, with firmware version 1.10, Icom added a new feature to make it easier to sync the internal oscillator to a GPS-disciplined oscillator or other high-stability external 10 MHz source connected to the REF IN jack on the rear panel. On the REF ADJUST screen in the SET menu, touch the SYNC TO REF IN button, and the radio will automatically adjust its internal reference frequency to match the high-stability source if one is connected. The manual notes that in an environment with sudden temperature changes, the transceiver may take longer to synchronize.

Conclusion

The amateur radio market is pretty small, so I'm always amazed when a manufacturer innovates for us. It must have taken many hours of development to put all that technology into one radio. It's expensive compared to a standard dual-band mobile radio, but this radio can do so much more. The main thing I like about this radio is that you can evolve from simple conversations on the local FM repeater to D-STAR digital operation, satellite operation, DXing, or contesting using SSB, CW, or digital modes (such as FT8 or MSK144). I think it's really worth the investment.

Manufacturer: Icom America, 12421 Willows Rd. NE, Kirkland, WA 98034; www.icomamerica.com. Price: IC-9700, \$1,700; RC-28 remote USB encoder with tuning knob, \$259; RS-BA1 remote-control software, \$95.