

“It could be the only radio you ever need”

The Yaesu FT-897 HF/VHF/

This latest transceiver from Yaesu is aimed at the amateur who wants a radio that will do everything – but is small and light enough to take anywhere. It is modelled on the popular FT-817 QRP rig in terms of its radio architecture and user control yet packs a full 100W output from the built-in AC mains PSU or 20W output from internal batteries. It is the smallest 100W radio on the market with a built-in power supply but with many features found only on larger radios – and a front panel of adequate size for serious use at home, in contests or on DXpeditions. Covering all bands from 160m to 70cm, all analogue and digital modes, broadcast FM / AM and aircraft AM, it could be the only radio you ever need.

BASIC FUNCTIONS

THE FT-897 measures 200W x 80H x 262Dmm and weighs a little under 4kg without PSU or batteries. The radio can be powered in one of three ways, with an external 13.8V supply, with the internal mains PSU or with batteries. The internal PSU and batteries cannot both be fitted at the same time and it is not really intended to chop and change between them. The mains PSU bolts underneath in place of the bottom cover and adds 15mm to the overall height and 1.6kg to the weight. It is a well-shielded switched mode design delivering 22A maximum, quite small and light considering its power rating. The batteries fit under the standard bottom cover and there is room to fit two. Each comprises a 4.5AH 13.2V Ni-MH pack fitted with a charging socket and each weighs about 800g. Only one battery is used at a time and a switch on the top

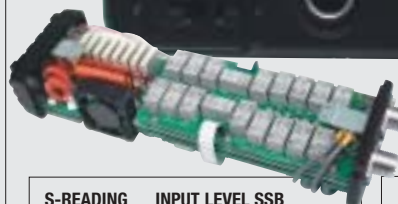
of the radio switches between the batteries. A special charger is required (CD-24) which takes its supply from either a 12V or 24V source and will fully charge each battery separately in about four hours. So a suitable supply is also required, even if you operate solely on batteries. One battery will power the radio for up to four hours mainly on receive, but considerably less with heavy transmit usage.

The receiver in the FT-897 tunes from 100kHz to 56MHz, 76 to 108MHz (wide-band FM mode only), 118 to 164MHz and 420 to 470MHz. The transmitter is enabled only within the exact amateur allocations with variants for different regions. Up / down keys scroll through the various amateur bands, general coverage and broadcast bands, and another pair of up / down keys scrolls through the modes – LSB, USB, CW, CW-R, AM, FM, Digital and Packet. Digital mode uses AFSK on SSB modes and is intended for RTTY, PSK31, SSTV etc. Packet mode uses FM and has settings for both 1200 and 9600 baud operation.

The transmit power output is 100W maximum on HF / 6m, 50W on 2m and 20W on 70cm. On internal batteries, the power output is limited to 20W (10W on 70cm). The radio is very ruggedly constructed on a die cast aluminium chassis with two internal cooling fans and a rather small

55mm diameter speaker in the case top. Two antenna sockets are provided, an SO239 for HF / 6m and a type N for 2m / 70cm. Other connectors on the rear panel provide DC power input, external speaker and key jacks, and two mini DIN connectors for data input and control. The single 8-pin control connector may be set via the menu system to provide control from a PC via an external level converter, control of the Yaesu range of auto ATUs, or control of the VL-1000 linear amplifier. Unfortunately, with just one socket this has to be dedicated to one function only. The radio does not contain a built-in auto ATU but a matching accessory, the FC-30, clamps to the side and provides matching for antenna VSWRs of up to 3:1 on HF or 2:1 on 6m. This unit uses relay switched capacitors and inductors and has 100 frequency stores but is a bit noisy.

Electrically, the radio uses a double conversion superhet receiver with IFs of 68.33MHz and 455kHz. DSP audio processing is used for extra filtering and noise reduction. The transmitter driver signal path and receiver front-



Left: The FC-30 ATU with covers removed.

YAESU FT-897 MEASURED PERFORMANCE

Receiver measurements

FREQUENCY	SENSITIVITY SSB 10dBs+n:n		INPUT FOR S9	
	PREAMP IN	IPO	PREAMP IN	IPO
1.8MHz	0.18µV (-122dBm)	0.4µV (-115dBm)	8µV	22µV
3.5MHz	0.16µV (-123dBm)	0.35µV (-116dBm)	8µV	22µV
7MHz	0.16µV (-123dBm)	0.35µV (-116dBm)	8µV	20µV
10MHz	0.16µV (-123dBm)	0.35µV (-116dBm)	7µV	20µV
14MHz	0.14µV (-124dBm)	0.32µV (-117dBm)	5.6µV	16µV
18MHz	0.14µV (-124dBm)	0.32µV (-117dBm)	5.6µV	14µV
21MHz	0.25µV (-119dBm)	0.35µV (-116dBm)	5.6µV	16µV
24MHz	0.22µV (-120dBm)	0.35µV (-116dBm)	5.6µV	16µV
28MHz	0.18µV (-122dBm)	0.32µV (-117dBm)	5.6µV	16µV
50MHz	0.1µV (-127dBm)	0.18µV (-122dBm)	2.5µV	7µV
144MHz	0.13µV (-125dBm)	-	2.8µV	-
432MHz	0.16µV (-123dBm)	-	2.8µV	-

AM sensitivity (28MHz): 0.9µV for 10dBs+n:n at 30% mod depth. **FM sensitivity** (144MHz): 0.18µV for 12dB SINAD 3kHz pk deviation. **AGC threshold:** 1.3µV. **100dB above** AGC threshold for +1.5dB audio output. **AGC attack time:** 1-3ms. **AGC decay time:** 30-200ms (fast), 0.3-3s (slow). **Max audio before clipping:** 8Ω 1.9W, 4Ω 3W at 2% distortion.

S-READING (7MHz)	INPUT LEVEL SSB	
	Preamp in	IPO
S1	1.8µV	4.5µV
S3	2.2µV	5.6µV
S5	3.2µV	8µV
S7	5µV	13µV
S9	8µV	20µV
S9+	120µV	220µV
S9++	1.5mV	4mV

MODE	IF BANDWIDTH		
	-6dB	-50dB	-60dB
SSB ceramic	2450Hz	3700Hz	6260Hz
2.3kHz mech	2400Hz	3750Hz	6130Hz
500Hz mech	590Hz	1720Hz	3390Hz
AM	7580Hz	13.6kHz	14.7kHz
FM	13.7kHz	22.0kHz	22.4kHz
FM(N)	9.7kHz	15.6kHz	15.7kHz

UHF Transceiver



end mixer are all wideband covering a remarkably wide frequency range from 160m to 70cm. Only the transmitter power amplifiers are separate, one for HF / 6m and the other for 2m / 70cm.

PRINCIPAL FEATURES

In addition to the usual dedicated controls and keys, three buttons below the display select most of the functions of the radio. 17 sets of button allocations are selectable and scrollable via the rotary channel selector which provides rapid and easy access to the various functions. In addition the menu system allows some 91 parameters of the radio to be set according to user preferences.

Main tuning uses a 45mm diameter rotary control in conjunction with the detented channel selector. The rotary dial tunes in 10 or 20Hz steps (2 or 4kHz per revolution), with higher rates on AM and FM, and a variety of mode dependent step sizes for the channel selector and more rapid frequency excursions. A momentary press of the power switch can select a faster tuning rate. This is not documented in the manual and not really intuitive! 200 regular memories are

included which may be partitioned into 10 groups of 20 channels and each channel may have an eight character label attached for easy identification. A one touch quick memory store allows one frequency to be rapidly stored and recalled and a separate home channel for each of the four band groups may be selected at the push of a button.

Selectable power saving features include auto power-off following lack of control activity, a transmission time limiter and auto turn-off of the display backlighting. The backlighting can be set to one of 32 colours and different colours can be set for different bands, modes, memory groups and other operating status conditions. The LCD indicates frequency to 10Hz resolution, memory channels or labels, mode and VFO status and function key labels. The battery voltage is permanently displayed and there is a bargraph type S-meter which indicates power, SWR, ALC level or modulation on transmit.

A number of small omissions and errors in the 68-page manual were found which is unusual for Yaesu who generally produce manuals to a very high standard.

MAINLY HF FEATURES

Twin VFOs are incorporated each with separate band stores. These can be used separately for CW and SSB segments or used together for split frequency operation. A clarifier (receiver incremental tuning) covers ± 10 kHz and functions on receive only. IF shift helps in reducing adjacent channel interference and an IF noise blanker is included for reduction of ignition and other impulse noise. The radio is provided

with a 2.4kHz ceramic IF filter for SSB and CW modes but space is provided to install two optional Collins mechanical filters, a 500Hz filter for CW and digital modes and a 2.3kHz filter with improved shape factor for SSB. A high stability reference oscillator may also be fitted as an option.

Other receive features include fast / slow AGC, RF gain control / squelch, variable CW pitch and a CW tuning aid. For strong signal situations, the receive preamp may be switched out (IPO) and a 10dB attenuator may also be switched in. On 2m and 70cm the receive preamp is permanently in circuit. Audio frequency DSP provides a sharp peaking filter on CW tracking the pitch setting, a bandpass filter on SSB with adjustable low and high frequency cutoffs, a notch filter tracking multiple heterodynes and DSP noise reduction facilities.

On transmit VOX is provided and an audio speech processor functioning on SSB and AM with DSP microphone equalisation to tailor the audio frequency response. Full and semi break-in is provided on CW together with a built-in electronic keyer adjustable in speed over the range 4 - 60WPM. Three 40-character message stores are available which are programmed as text. These can be cascaded for longer messages and one can be set into auto repeat mode to provide a beacon facility. This can be useful for 50MHz DXpedition use. The internal keyer can also be used for code practice, sending and displaying five-character groups via the internal sidetone.

The FT-897 is well equipped with facilities to handle digital and packet modes. As well as the predefined

Rear view of the FT-897 with the FC-30 ATU fitted to the side of the transceiver.



Frequency	INTERMODULATION (50kHz Tone Spacing)		IPO	
	PREAMP IN		IPO	
	3rd order intercept	2 tone dynamic range	3rd order intercept	2 tone dynamic range
1.8MHz	+2.5dBm	89dB	+3.5dBm	85dB
3.5MHz	+4dBm	91dB	+11.5dBm	91dB
7MHz	+2dBm	90dB	+13dBm	92dB
14MHz	+4dBm	92dB	+21dBm	99dB
21MHz	+5.5dBm	89dB	+20.5dBm	97dB
28MHz	+6dBm	92dB	+22.5dBm	99dB
50MHz	-2dBm	90dB	+7dBm	92dB
144MHz	-2dBm	88dB	-	-
432MHz	0dBm	88dB	-	-

CLOSE-IN INTERMODULATION ON 7MHz BAND					
Spacing	PREAMP IN		IPO		
	3rd order intercept	2 tone dynamic range	3rd order intercept	2 tone dynamic range	
3kHz	-41dBm	61dB	-36dBm	60dB	
5kHz	-35dBm	65dB	-29dBm	64dB	
7kHz	-28dBm	69dB	-22dBm	69dB	
10kHz	-15dBm	75dB	-14dBm	74dB	
15kHz	-9dBm	82dB	-3dBm	81dB	
20kHz	-1dBm	87dB	+3dBm	86dB	
30kHz	+2dBm	90dB	+11dBm	91dB	
40kHz	+2dBm	90dB	+13dBm	92dB	
50kHz	+2dBm	90dB	+13dBm	92dB	

FREQUENCY OFFSET	RECIPROCAL MIXING FOR 3dB NOISE	BLOCKING PREAMP IN
3kHz	68dB	-39dBm
5kHz	74dB	-38dBm
10kHz	82dB	-37dBm
15kHz	88dB	-32dBm
20kHz	91dB	-26dBm
30kHz	96dB	-18dBm
50kHz	102dB	-11dBm
100kHz	108dB	-11dBm
200kHz	116dB	-11dBm

modes of PSK31, RTTY and packet, two user definable modes (USB and LSB) are also included. These can be used for SSTV or a future new digital mode.

MAINLY VHF / UHF FEATURES

The FT-897 includes all the features which are available on modern FM equipment. Both wide and narrow FM modes are provided covering 25 / 12.5kHz channelling on VHF / UHF or 10kHz on 29 / 50MHz. Both the receiver bandwidth and transmitter deviation levels are set appropriately. For repeater operation, the shift is separately programmable on 10m, 6m, 2m and 70cm and can be automatically selected according to the bandplan in use in the relevant region on 2m and 70cm. The transmit and receive frequencies can be reversed by a single key press to check for activity on a repeater input channel.

Various selective access methods are provided including CTCSS tone encoder and tone search, 1750Hz tone burst, Digital Coded Squelch and associated code search and the Yaesu ARTS (Auto Range Transponder System). This uses DCS signalling to determine when two ARTS equipped stations are within communications range.

Various scanning modes are implemented which include between programmed limits, across memory channels which may be tagged for skipping, Dual Watch and Priority Channel Scanning. Dual Watch allows VFO-B to be checked every 5s whilst using VFO-A for normal communication purposes, and Priority Channel Checking lets you operate on a memory channel while checking memory channel 1 every 5s. Smart Search is a useful feature when travelling in a new area and functions on AM and FM. A scan is initiated in VFO mode and the first 50 active channels are loaded into special memory.

The FT-897 also includes a spectrum scope monitor which monitors activity 10, 15 or 63 channels on either side of the receive frequency

and displays relative signal strength as a bargraph on the LCD. The channel step size is selectable. Normal receiver operation is disabled whilst the spectrum monitor is functioning.

The FT-897 can also be used in conjunction with a transverter via the antenna socket. Two transverter settings may be accommodated and the display set to read the transverted frequency up to 9.999GHz. Full operation is not covered in the manual.

MEASUREMENTS

Measurements were made with the review radio powered from the internal mains PSU and are summarised in the tables.

The current consumption on receive measured some 600mA increasing to 1A with the FC-30 auto-ATU connected. This extra current is mainly due to the fan in the FC-30 which runs continuously. The sensitivity was very good on all bands but reduced significantly at LF (5µV at 136kHz). The rejection of spurious responses was generally very good. The AGC recovery time was very dependant on level and set rather too fast for my liking. The strong signal performance (intercept and dynamic range) was rather poor close-in but fairly average at wider spacings and the in-band distortion was poor particularly at fast AGC settings. The reciprocal mixing figures are rather poor compared with some other radios and this means that the IF filter skirts tend to be masked by noise. The overall selectivity and adjacent channel results are shown in Fig 1.

On transmit the results are generally good with the CW keying waveform of low distortion although the fall time is a little sharp. SSB intermodulation products are average to poor but data switching times are good.

ON THE AIR

I found the FT-897 to be an excellent all-round radio. Considering its small size and high number of features, the radio is very easy to use, the controls are well positioned, of a good size, rugged and have a positive action. 17 sets of function keys is about the limit

and perhaps too many for easy access although more direct access buttons may have been an advantage.

The receiver was very lively, sensitivity was excellent and coped well with most situations although some strong signal problems could be provoked on the lower bands during darkness. At times the IPO selection (preamp switched out) was not sufficient and the attenuator needed to be switched in circuit to give clean results. The internal speaker gave reasonable communications quality but tended to rattle at higher levels. However, with an external speaker or headphones the quality was excellent. The performance on AM and FM broadcast was also excellent. I preferred to use the AGC slow setting on all modes, except perhaps when using full break-in, to prevent background noise returning between Morse characters and speech symbols in a disconcerting way. The DSP filters were a definite help and the notch fairly effective although not as deep as in some radios. DSP noise reduction seemed rather more effective than with some earlier implementations of this feature.

Power supply noise and spuri were virtually inaudible, just a couple of little 'gurgles' on 80m with the antenna disconnected. The FC-30 auto ATU tuned quickly in about 2 seconds maximum with a clattering of relays but the fan which runs continuously is rather noisy. On transmit good audio quality reports were received and the CW keying effective at full break-in.

CONCLUSIONS

The FT-897 lives up to its promise as a true go-anywhere, do-everything radio with good user ergonomics and a good overall performance. The basic radio is currently listed at £1099 but the extras can add significantly to the price. The FP-30 internal mains PSU costs around £200, the batteries are £100 each and the CD-24 charger a further £100. The FC-30 ATU is £250. No doubt package deals will be available from the main retailers.

My thanks to Yaesu UK for the loan of the review items. ♦



Under the top cover of the FT-897.

YAESU FT-897 MEASURED PERFORMANCE

TRANSMITTER MEASUREMENTS

FREQUENCY	CW POWER		SSB(PEP) POWER		INTERMODULATION PRODUCTS		
	OUTPUT	HARMONICS	OUTPUT	HARMONICS	3rd order	5th order	
1.8MHz	100W	100W	-65dB	-26 (-20)dB	-26 (-20)dB	-36 (-30)dB	
3.5MHz	98W	100W	-70dB	-26 (-20)dB	-26 (-20)dB	-36 (-30)dB	
7MHz	97W	100W	-60dB	-26 (-20)dB	-26 (-20)dB	-36 (-30)dB	
10MHz	97W	100W	-58dB	-28 (-22)dB	-28 (-22)dB	-38 (-32)dB	
14MHz	98W	100W	-60dB	-28 (-22)dB	-28 (-22)dB	-38 (-32)dB	
18MHz	98W	100W	-57dB	-28 (-22)dB	-28 (-22)dB	-34 (-28)dB	
21MHz	98W	100W	-57dB	-26 (-20)dB	-26 (-20)dB	-34 (-28)dB	
24MHz	99W	100W	-64dB	-26 (-20)dB	-26 (-20)dB	-34 (-28)dB	
28MHz	100W	100W	-64dB	-26 (-20)dB	-26 (-20)dB	-30 (-24)dB	
50MHz	96W	98W	-68dB	-23 (-17)dB	-23 (-17)dB	-29 (-23)dB	
144MHz	50W	50W	-70dB	-26 (-20)dB	-26 (-20)dB	-32 (-26)dB	
432MHz	19W	19W	-67dB	-32 (-26)dB	-32 (-26)dB	-38 (-32)dB	

Two-tone transmitter intermodulation product levels are quoted with respect to PEP, figures in brackets are with respect to either tone.

Carrier suppression: >60dB.

Sideband suppression: 60dB @ 1kHz FM deviation: 4.6kHz (wide) 2.2kHz (narrow)

SSB T/R switch speed: mute-TX 20ms, TX-mute <1ms, mute-RX 12ms, RX-mute <1ms.

NOTE: All signal input voltages given as PD across antenna terminal. Unless stated otherwise, all measurements made on SSB with the receiver preamp switched in.

Fig 1: FT-897 effective selectivity curve on USB

