

HF-225

communications receiver



HF-225



The demands made on a short wave receiver when used in the Western hemisphere, and particularly in Europe, are great indeed. Such a receiver has to be capable of resolving weak signals in a welter of almost unbelievably strong transmissions, and provide high sensitivity at the same time as high immunity to overload. Sadly, many short wave receivers, even those produced by well known companies in the domestic radio field, fail to survive in this demanding application.

The HF-225 has been designed specifically to give the dedicated short wave listener a receiver which fulfils all his requirements, whilst doing it within an attractive price. The performance of the HF-225 approaches that of professional receivers costing up to ten times its price, and the simple appearance of the HF-225 hides a very comprehensive specification.

The HF-225 short wave receiver was conceived, designed and is "Made in Britain" for the DX enthusiast. Its ability to perform on a crowded band with strong adjacent stations was a major consideration in its design. The HF-225 is also easy to use, the controls being simple and sensible. Essential bandwidth filters which are often options on other equipment are fitted as standard. Unnecessary frills are not included and their omission is deliberate. The result is an affordable high performance receiver.

The HF-225 has continuous coverage from 30 kHz to 30 MHz. Operating modes are AM, USB, LSB and CW. An optional board (D-225) adds FM and synchronous AM. Unlike other receivers, the HF-225 comes complete with a

comprehensive range of bandwidths; a 2.2 kHz filter for SSB transmissions or for resolving an AM station using SSB mode and ECSS technique (exalted carrier, selectable side band); a 4 kHz, 7 kHz or 10 kHz filter for AM reception, the width chosen dependant on the signal and band conditions, and for the CW enthusiast a 200 Hz audio filter is included as standard.

Operating the HF-225 is refreshingly simple. The receiver is switched on by a combined on/off volume knob and displays the last frequency used on a large backlit liquid crystal display.

Two buttons, one marked up, the other down, select the correct megahertz and you tune to the required frequency using a large heavy knob with a thoughtfully provided finger recess. The tuning rates relate to a simple design concept of two stations per knob revolution on each mode. Tuning on SSB and CW is on 8 Hz steps. This allows extremely accurate resolution of SSB signals and ECSS reception of AM. On AM and FM the tuning step is increased to provide comfortable station selection. As well as providing the optimum tuning rate whilst you are carefully looking for a weak signal, the HF-225 automatically increases its stepping increment as the knob rotation speed increases. The result is an extra rapid frequency shift to a new part of the band. There is also an optional keypad controller (K-225) for even quicker frequency selection by direct numerical entry.

Mode selection is by a front panel switch. Initial filter selection is automatic and dependant on mode. AM switches in the 7 kHz filter and SSB/CW the 2.2 kHz filter. Checking the filter in use is easy, a momentary press of the FILTER

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SELECT button and the frequency display changes to indicate the current filter width, another press of the button identifies the next filter on the display and at the same time switches to it. Repeated pressing of the button switches in the other filters in turn. After a period of 3 seconds or immediately the VFO knob is turned, the display reverts to the frequency. Filters available for use on AM and SSB are 2.2, 4, 7 and 10 kHz and on CW, 2.2 kHz and 200 Hz. If the D-225 optional board is fitted and synchronous AM is selected the receiver automatically switches to the previously selected AM filter. Again this choice can be overridden. On FM, filter width is fixed at 12 Hz, the filter-select button now switching the squelch in or out. The squelch level control is found on the rear panel.

To further enhance reception other facilities are included. A noise blanker is permanently in circuit to deal with vehicle ignition interference, 20 dB of R.F. attenuation can be switched in when required and a HF or LF cut tone control can be applied to the audio output.

The HF-225 has 30 memories which store receiver frequency settings. There are four memory functions; "preview" where by pressing the MEMORY SELECT button, the memory channel number is shown on the display, followed by the frequency held in that channel. The memory channels can be previewed in sequence by rotating the main tuning knob. During memory preview, the receiver remains tuned to the original VFO frequency. Pressing RECALL transfers memory frequency to VFO, and the receiver can be tuned away from the recalled frequency if required. Pressing CHANNEL is similar to the preview function except that in CHANNEL mode, the receiver tunes directly to each memory frequency as it is selected by the main tuning control. The store buttons transfer a frequency from VFO to the selected memory channel.

Having now found the optimum reception the outstanding performance of the HF-225 is revealed. Typical values for frequencies greater than 2 MHz are an SSB sensitivity of 0.3 μ V for 10 dB S/N and on AM, 0.6 μ V for 10 dB S/N at 70% modulation. For the technically minded, the intermodulation free dynamic range is >93 dB at 50 kHz spacing, and reciprocal mixing is >90 dB at 10 kHz in the SSB mode. All image and spurious responses have greater than 80 dB rejection.

Connections are included for both 50 and 600 ohm impedance aerials (SO-239 and a terminal block). The receiver has a 6mm jack socket for headphones on the front panel and two 3.5mm sockets on the rear panel, one for an external loudspeaker and the other for tape recording.

The HF-225 operates from 12 volts DC and is therefore suitable for use from an external battery whilst caravanning or boating. For home use an AC mains adaptor is supplied with the receiver. For truly portable listening, in the garden or on a hilltop, an internal rechargeable battery pack is available

(B-225). A high quality carrying case (C-225) will afford complete protection for the HF-225 when used as a portable, and to complete the system, an active whip aerial is available (W-225). The active aerial may equally be used at home if required. Operation on a fully charged Nicad pack is around 8 hours.

Compact and light weight, the HF-225 is 255mm wide, 100mm high and 200mm deep, a portable high performance short wave receiver.

HF - 225 SPECIFICATIONS

Frequency coverage	30 kHz to 30MHz continuous coverage. 150 kHz to 26.1 MHz
Reception modes	AM, LSB, USB, CW, Narrow band FM*, synchronous AM (AMS)*.
Receiver system	Microprocessor controlled PLL tuning, dual conversion superheterodyne receiver. First intermediate frequency 44.999 MHz to 45.000 MHz. Second intermediate frequency 435 kHz.
Displays	5-digit backlit LCD showing receiver frequency to the nearest kilohertz. Additional indicators show memory mode and AMS detector lock. Analogue signal strength meter, calibrated S1 to S9, +10dB, +30dB and +50dB.
Tuning	fly spin wheel, MHz band buttons and Direct keypad frequency entry*. Tuning rates CW, SSB, and AMS modes - 8 Hz steps, 1.6 kHz per revolution. AM mode - 50 Hz steps, 9 kHz per revolution. FM mode - 125 Hz steps, 25 kHz per revolution. Tuning step size increases with rapid spin-wheel rotation. Keypad frequency entry is to 1 kHz resolution.
Memories	30 frequency memories selected with tuning spin- wheel. Data held with lithium battery back-up for >5 years. Memories 1 to 10 can be selected from the keypad*. Memory functions: Store, Recall, Preview and Channel. Two tuneable frequency stores, A and B. Current tuned frequency is saved when the receiver is switched off.
IF Filters	SSB and AM: Operator selectable 2.2, 4, 7 and 10 kHz. AMS: Operator selectable 2.2, 4, 7 and 12 kHz. CW: 2.2 kHz. FM: 12 kHz. (750 μ s audio de- emphasis).
Audio Filters	200 Hz wide audio peak filter centred on 800 Hz, selectable in CW mode.
RF Attenuator	Operator selectable 20 dB attenuator.
Controls	Power on/off and volume control. Tone control (high pass/low pass). Mode switch - CW, LSB, USB, AM, AMS, FM. Memory mode select button. RF attenuator/Memory CHANNEL button. Filter select/Memory RECALL button. MHz Down/Memory STORE button. MHz Up/Memory STORE button. Tuning/Memory select spin-wheel.

* Indicates facility available if appropriate option fitted.

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Aerial inputs	Aerial select switch (on rear panel).
	FM squelch level (on rear panel).*
50 Ω input via SO-239 socket.	600 Ω input and Earth connection on spring terminals.
	High-impedance active aerial input for whip antenna via SO-239 socket*.
Audio outputs	Record output at approx 350 mV (3.5 mm jack socket)
	External loudspeaker (3.5 mm jack socket)
Headphone output (mono or stereo headphones) (6 mm jack). The internal loudspeaker is disconnected when headphones or an external loudspeaker are plugged in.	Power supply
	External 12V DC supply (2.1mm power jack).
240V AC Mains power unit supplied as standard.	Internal Ni-Cd rechargeable batteries with charging circuit*.
	Dimensions
Size 253 x 109 x 204 mm (WxHxD, overall)	Weight
	approx 1.9 kg (2.6 kg with internal batteries).

Receiver Performance

Sensitivity	Signal levels are in micro-volts (μ V) PD across the 50 Ω aerial input.
AM and SSB sensitivity measured with 10 dB signal/noise ratio at the receiver output.	FM sensitivity measured for 12dB SINAD.
	AM signal - modulated to 70% depth at 1 kHz.
FM signal - deviated by 3 kHz at 1 kHz.	SSB signal - unmodulated, resolved at 1 kHz.

Receiver Frequency.....	60 kHz to 2 MHz:
	AM < 1.2 μ V typically 0.8 μ V
FM < 1.0 μ V typically 0.7 μ V	SSB < 0.6 μ V typically 0.4 μ V
	2 MHz to 30 MHz
AM < 0.9 μ V typically 0.6 μ V	FM < 0.9 μ V typically 0.6 μ V
	SSB < 0.5 μ V typically 0.3 μ V

Selectivity	I F Filter	Bandwidth (kHz)	Shape factor	
			6:60 dB	
2.2 kHz	2.3 at -6dB	3.4 at -60dB	1:1.5	
		5.5 at -80dB		
4 kHz	5.9 at -6dB	9.8 at -60dB	1:1.7	
		10.7 at -80dB		
7 kHz	8.8 at -6dB	12.9 at -60dB	1:1.5	
		14.6 at -80dB		
10 kHz	10.5 at -6dB	21.5 at -60dB	1:1.2	

200 Hz audio filter centred on 800 Hz.	Bandwidth 170 Hz at -6dB, 850 Hz at -20dB.
	SSB carrier point attenuation (2.2 kHz filter) 20 dB.
CW mode filter position : (ref carrier frequency)	-6dB points at -0.8 kHz and +1.35 kHz.
	Resolved audio 800 Hz at carrier frequency.
FM Adjacent channel selectivity :	12.5 kHz channels 40 dB(1.5 kHz deviation)
	25 kHz channels 65 dB(3.0 kHz deviation)
FM signal capture ratio	9 dB
	Reciprocal mixing effects : (2.2 kHz filter)
> 80 dB at 5 kHz from wanted signal.	> 90 dB at 10 kHz from wanted signal.
	> 105 dB at > 100 kHz from wanted signal.
Intermodulation effects : (2.2 kHz filter)	At 10 kHz signal separation,
	3rd order intercept point > +3 dBm
Intermodulation-free dynamic range > 85 dB	At > 50 kHz signal separation,
	3rd order intercept point > +12 dBm
Intermodulation-free dynamic range > 93 dB	

* Indicates facility available if appropriate option fitted.

Spurious responses	Images :	At +90 MHz >75 dB rejection
	Fixed responses :	At +910 kHz > 90 dB rejection
Frequency stability	At 45 MHz >85 dB rejection	
	At 455 kHz >100 dB rejection	
Frequency error < \pm 50 Hz.	At 22.5 MHz >75 dB rejection	
	(Typical performance only - not guaranteed spec)	
Noise blanker	At constant 20C	Drift < \pm 30Hz in one hour.
	-15C to +50C	Frequency error < \pm 200 Hz.
Audio output	Audio blanking triggered by IF signal level.	
	Permanently enabled on all reception modes.	
Blanking period 500 μ s.	Threshold level 12 dB above normal carrier.	
	1.6 W into 8 Ω at 5% THD	
(with 12V power supply unit).	2.0 W into 4 Ω at 5% THD	
	(with 12V power supply unit).	
External loudspeaker output is suitable for	loudspeakers with impedances of 4 Ω or greater.	
	Headphone output : up to 4 Volts from 220 Ω .	
Record output : 350 to 400 mV from 5 k Ω .		
	Frequency response	(Tone control in central position)
Tone control action	(7 kHz filter, AM mode)	
	Distortion	AM mode : 1 kHz signal modulated at 70% depth.
With standard AM detector :	THD 1%	
	With synchronous detector	THD 0.6%
SSB mode : 1 kHz resolved signal	THD 0.2%	
	Two signal IM products > 35 dB below wanted	
signals, with signal separation > 180 Hz.		
	AMS Detector	Lock range: \pm 100 Hz
Audio distortion under carrier-fade conditions:	Signal modulated to 70% depth at full carrier level.	
	6 dB carrier reduction: 2.8% THD	
(23% with conventional AM detector).	10 dB carrier reduction: 4.0% THD	
	(39% with conventional AM detector).	
20 dB carrier reduction: 4.1% THD	(50% with conventional AM detector).	
	Power supply	DC supply 10 to 15 V (12 V nominal).
Quiescent current 200 mA (no options, no audio output)	Typical power consumption 250 to 300 mA	

HF-225 options

B-225	Internal Ni-Cd battery pack giving typically 8 hours operation from a full charge. The batteries charge from the standard 12V supply when the receiver is turned off.
C-225	Carrying case with shoulder strap.
D-225	Additional detector unit providing narrow-band FM and synchronous AM modes.

K-225	Remote data entry keypad, (connected by wire).
S-225	External high-quality loudspeaker, 8 Ω .
W-225	Telescopic whip antenna (1.2m long) with internally fitted preamplifier and matching unit.

Specification subject to change without notice.

