The Eddystone lighthouse shines again!

The Editor has been keen for some years for John Wilson to explore the innards of an up-to-date British classic receiver. This month, that wish becomes a reality as John reviews the Eddystone 6200 professional receiver.

It seems strange that in seven years of reviewing h.f. receivers I have not had the pleasure of checking out an Eddystone product. I had imagined that this was due to the changing market for receiver manufacturers, although I was one myself, and the last Eddystone model of which I had any knowledge was the 1650, but that was many years ago. It was with anticipation therefore that I unpacked the large box, containing an Eddystone 6200, which our editor had managed to extract from the manufacturer for this review. I confess to being less than knowledgeable about the intricacies of the recent history of Eddystone Radio, but a little digging around turned up the information that Eddystone was saved from extinction at the last minute by the Megahertz Group which bought out Eddystone Radio Ltd. on the 14th of May 1999 just before final closure was threatened. However, a news letter from Cambridgeshire dated 1st April 2002 (no, it's not an April joke) revealed that Megahertz Communications of Coldhams Lane (happy memories for those of us who lived and worked in Cambridge in the early 1960s) had gone into voluntary liquidation, and that the managing director, Ashley Coles, had formed a new company called Ring Communications based in Ely. Where does all this get us? It gets us to the point that Eddystone Radio is still a part of Ring Communications and it was they who kindly offered the Eddystone 6200 receiver for review. And that's what this article is all about.

Handsome Receiver

The 6200, as you can see from the photographs, is quite a handsome receiver and a far cry from the large and weighty lumps which Eddystone produced in those far-off days. The front panel is a mere 2U high (long live the Imperial measurement of "U") and is of course designed to fit into a standard 19-inch rack. The

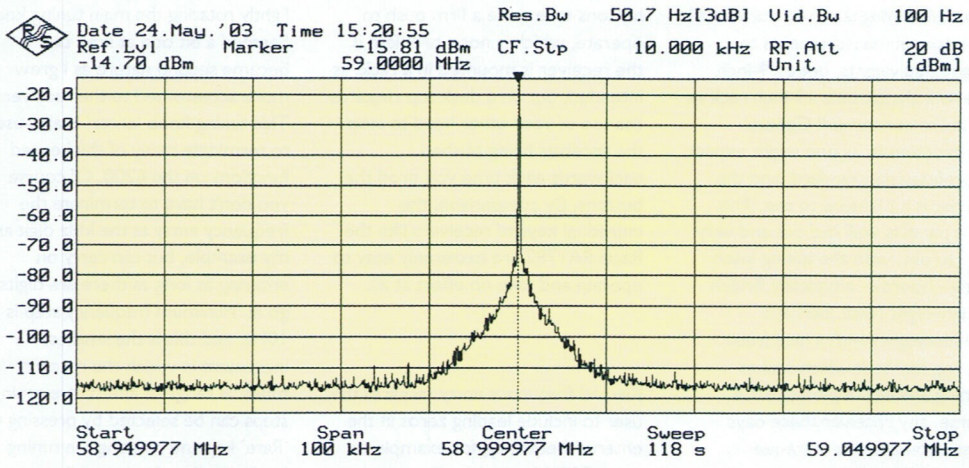


Fig.1: The spectrum plot of the 6200 first conversion oscillator, radio tuned to 14MHz hence 59MHz local oscillator.

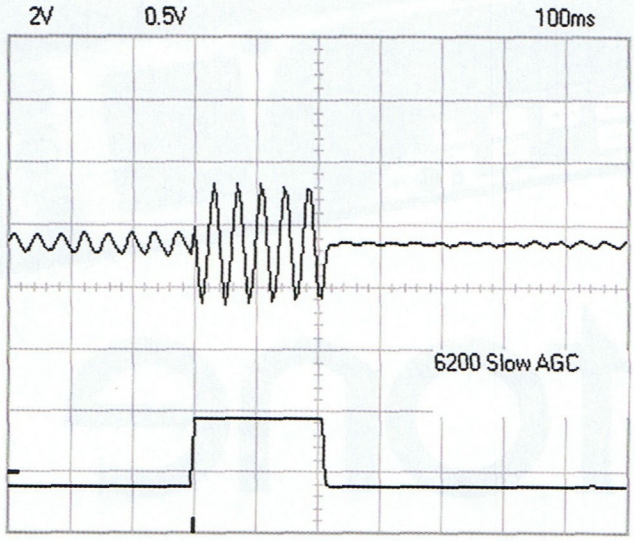


Fig. 2: The audio output from the 6200 with slow a.g.c. selected.

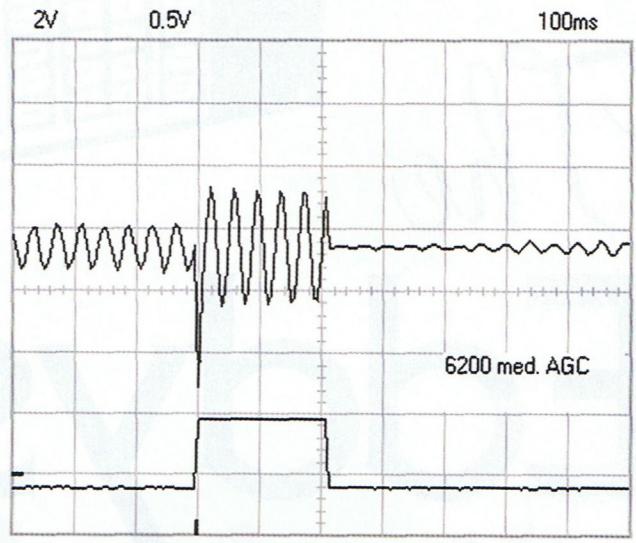


Fig. 3: The audio plot from the 6200 with medium a.g.c. set.

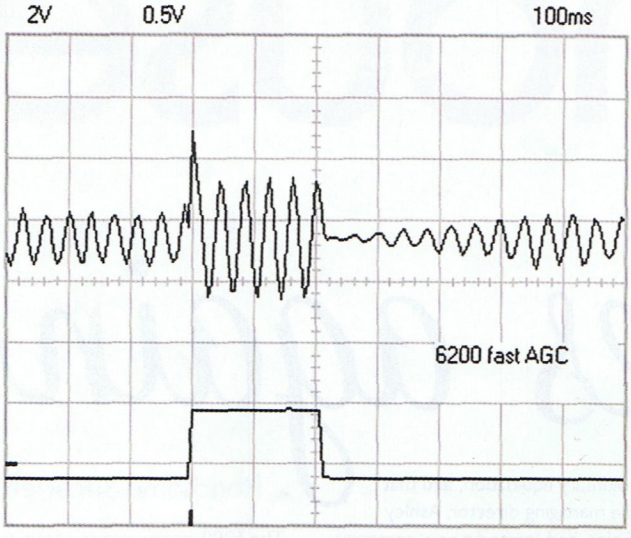


Fig. 4: The audio output with fast a.g.c. when hit by a signal increase of 50dB at the antenna.

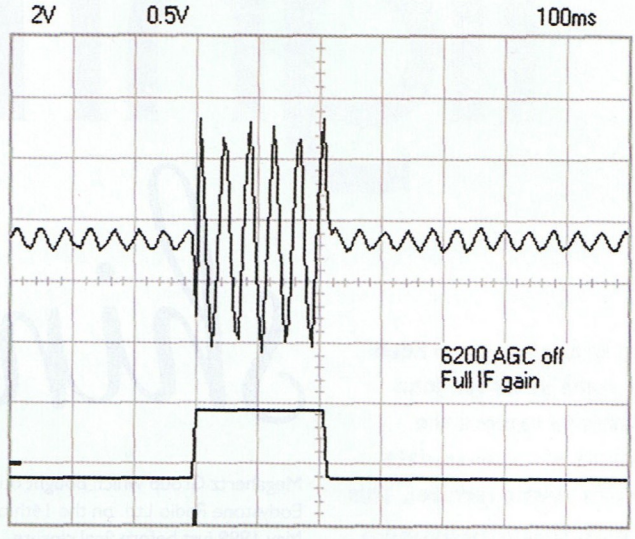


Fig. 5: The a.g.c. switched off, and even with the i.f. gain at maximum the 6200 behaved well.

receiver is quite deep (17 inches) and weighs in at about 11kg, which is quite a lot to hang on the front panel support, so it would probably need a rack shelf inside the overall rack enclosure. No doubt the sub at *Short Wave Magazine* will convert all my Imperial measurements to metric equivalents, but a 19-inch rack will always be a 19-inch rack as far as I'm concerned! General construction is, as one might expect, to professional standard, and the interior is a pleasure to see. The front panel is well laid out and very easy to use, with the tuning knob being - hooray - a typically British heavyweight (well, perhaps middleweight) with a nice free-running feel to it which makes "tuning around" a pleasure. Of course, any receiver these days must also have direct frequency entry, in this case using a membrane keypad to the left of the main display. The layout of the keypad is not the familiar telephone style and takes a little getting used to at first, but the pads are a decent size and the numbers easy to read. As with all membrane pads, the individual buttons take quite a firm push to operate, which is not a problem if the receiver is mounted in a rack, as intended, but on a desk top requires the use of your other hand to stop the receiver being pushed backwards each time you prod the buttons. By comparison, the individual keys of receivers like the Racal RA1792 are extremely easy to operate and take no effort at all.

All Digits Required

Keypad frequency entry requires the user to include leading zeros in the entered frequency, for example to enter 909kHz you have to enter 0,0,9,0,9, and then terminate the entry to select the frequency. However, when I first looked for the 'enter' key I couldn't find it, so had to refer to the handbook (always a good idea) which told me that the 'enter' function was accomplished by lightly rotating the main tuning knob. Seemed a bit odd at first, but became second nature as I grew more accustomed to the receiver. This tuning knob 'enter' is also used to terminate many of the keypad functions on the 6200. Of course, you don't have to terminate the frequency entry at the kHz digit as in my example, but can carry on entering as long as there are digits to go at. Minimum frequency step is 10Hz, and this is the smallest increment in which the receiver tunes. A range of alternative tuning steps can be selected by pressing the 'Rate' key and rotating the tuning knob to select from a well chosen series from 10Hz to 100kHz, including the all-important European 9kHz step for the broadcast bands. With the 'Rate' function in use you can also enter any step size in 10Hz increments from the numeric keypad, and finally, if you select '0' from the step table the receiver will then tune in 10Hz steps but with a variable tuning rate according to the speed of rotation of the main tuning knob. Some of you will know that I have a basic dislike for this type of tuning, but on this occasion I have to say that the speed-up happens so unobtrusively that it is really enjoyable to use, and I found myself leaving the speed-up system in operation most of the time.

The frequency display is easy to read, being the customary black on green/yellow l.c.d., and all receiver functions are monitored by the display including reception mode, a.g.c. mode, r.f. sensitivity, signal strength, squelch level/i.f. gain,

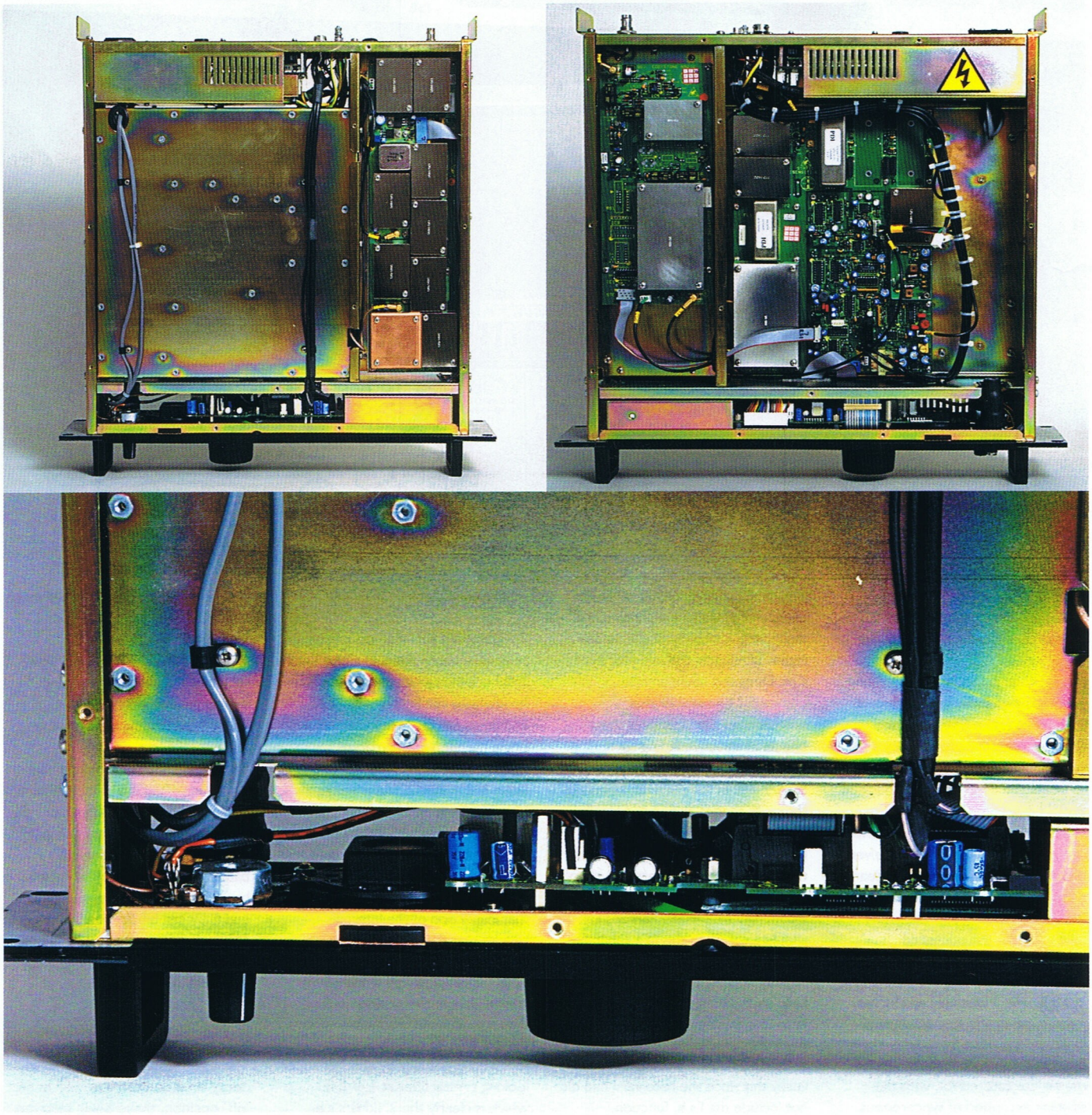
memory channel number and i.f. bandwidth. A very useful table in the handbook cross-correlates all the display functions used in different modes of use and tells you what the main tuning knob is doing in these modes. For example, in 'channel' mode the tuning knob selects the memory channels; in 'rate' mode the knob selects tuning rates; in 'BITE' mode it selects the BITE test numbers, and so on. For a quite complex receiver the designers of the 6200 have done a very good job in making operation very clear and logical, and have ensured that the regularly used functions remain in place and accessible at all times rather than being 'buried' in layered menus. One indication of the well thought out integration is the fact that apart from the tuning knob, the only other rotary control on the panel is the a.f. gain, and yet the receiver is easy to operate at all times.

Generous Bite

The built in test equipment 'BITE' is almost essential for commercial use but even for the hobby listener it's reassuring to know that the receiver is keeping an eye on itself and will tell you if and when something is not quite right. Apart from the continuous 'passive' BITE mode, the user can step through a wide range of internal tests, with up to 52 individual tests being detailed in the user manual. If you can't find out where a fault is located using this system then you shouldn't go any further – call in an expert. The handbook is very helpful in this area, and in fact is well thought out and easy to follow in all its sections. However, despite several requests, we were unable to obtain any circuit information on the 6200 and any of my comments on receiver architecture are based on my own visual interpretation of the board layouts. Why so shy about schematics? One caveat about 'BITE' is the remark in the manual that: "A fault producing 15-30dB or more of gain loss will be needed to produce FAIL. Thus, PASS is not necessarily an indication of full receiver performance". I think that I might notice a loss of 15 to 30dB in performance without the intervention of the BITE system!

Brain Storming

Further facilities of the 6200 include 99 memory channels, each storing all receiver parameters, memory scanning, and a sweep facility which allows the user to programme the



receiver to scan between frequencies stored in adjacent memories in steps selected by the 'Rate' function. Obviously, it is helpful if the scanning and sweeping functions also allow the receiver to stop on an active frequency and these facilities are provided by selectable 'dwell' and 'delay' settings, all under the control of the operator. Presumably some kind of brain storming sessions have been carried out at an early stage in this receiver design, because provision has clearly been made for most of the operating features needed today. Let's now take a look at the published specification.

The 6200 coverage is 10kHz to 30MHz, and it certainly works well right down to the 10kHz bottom limit, making this a 'proper' European receiver. Most reception modes are catered for, with the singular exception of synchronous a.m., but in this quality of receiver the use of selectable sidebands and the inherent stability of the design rather eliminates the need for Sync. a.m. Does this seem an odd comment? Remember that synchronous a.m. removes the effects of selective fading by generating a local demodulation carrier within the receiver, but using the s.s.b. modes also uses a locally generated carrier, so the effect is (more or less) the same, allowing for the fact that the local carrier will not necessarily be in phase with the incoming a.m. carrier. Perhaps I should expand on this in a separate article! Variants of the 6200 give additional reception modes including f.s.k. and i.s.b., and there is a neat little f.s.k. tuning indicator already on the front panel which must be extremely helpful, although I couldn't verify this since the receiver I had did not include the f.s.k. function.

Filters

The standard receiver has only two selectable bandwidths at 6 and 2.4kHz although up to two more bandwidths can be provided by additional filters. There was not a single mention in the manual provided regarding what option filters are available, but it seems from the basic receiver architecture that bandwidths wider than 6kHz may not be possible - but I could well be wrong in this assumption. The reason for thinking this way is that inspection of the internals reveals that there is clearly a high quality roofing filter at 45MHz - and what a change to find a decent crystal filter in this position rather than a couple of ceramic two-pole devices as is so often the case - followed eventually by another super looking crystal filter at 1.4MHz which is clearly the 2.4kHz s.s.b. filter, with empty slots for two more 1.4MHz filters. My assumption therefore is that the 6kHz bandwidth is achieved at 45MHz with the narrower bandwidths determined by filters at 1.4MHz. Thus, if the roofing filter is 6kHz wide, it follows that wider bandwidths than 6kHz cannot be provided unless this roofing filter is changed. The manual does not help on this point, so perhaps I could be forgiven for being wrong. r.f. bandwidth in the standard receiver is broadband, but an optional front-end filter can be obtained which provides sub-octave filtering above 1.6MHz (option /A for those who might buy a 6200).

AGC

The a.g.c. system has three fixed decay time constants as well as an 'off' position, these being selected

by repeated pressing of the appropriate keypad button, and an adjacent button selects three steps of r.f. sensitivity. Again, inspection of the physical internals suggests that there is a 10dB preamplifier used at 'MAX' gain setting, with this being bypassed in the 'MED' setting, and further attenuation in the 'MIN' setting. The 10dB difference was easily confirmed by measurement, but the 'MIN' setting made the receiver so insensitive that I can't help feeling that there was something amiss, although the manual does state that the 'MIN' setting introduces at least 30dB of attenuation, bringing the sensitivity for 10dB S/N ratio down to something like a standard S9. I guess if you were on board ship in close proximity to high power r.f. this may be a necessary feature, but for the enthusiast market I can't see that anyone would need the setting. On the subject of high power in close proximity, the 6200 in common with other professional receivers is well protected at the front-end by automatic disconnection at antenna levels in excess of 30V r.m.s. (that's 18W of r.f. in a 50Ω system).

A side-by-side vertical bar graph on the main display shows signal strength and squelch settings together, so that you can match the squelch level with wanted signal level, but the signal strength metering is very vague, with no attempt at calibration, either in absolute antenna levels or 'S' units, and this is probably the least satisfactory feature of such a good receiver. One would have imagined that professional users would have wanted some measured indication of input signal level when setting up an h.f. system, but this is not provided by the 6200. And so to measured performance:

On The Bench

Sensitivity, measured using an H-P 8657A or Rohde & Schwarz SMY-01 signal generator, and H-P 8903B audio analyser. Levels are given for 12dB SINAD. a.m. modulation at 1kHz, 60%. s.s.b. for 1kHz equivalent audio input. These figures are taken with r.f. sensitivity set to maximum. On the medium setting the sensitivity is reduced by 10dB.

The third order intercept point measured at 20kHz spacing came out at +13dBm with a dynamic range of 98dB, whilst the second order intercept point using my out-of-band test signals of 6.5 and 7MHz. resolving the second order product at 13.5MHz came out at +38dBm. This is lower than I have seen in other professional receivers but matches the figures given in the 6200 handbook. As the handbook also states, the second order performance is increased when the preselector is fitted, but it does not say by how much. On the plus side, the reciprocal mixing figures are very good, indicating that the 6200 synthesiser is very clean:

Spacing from carrier	dBc/Hz
5kHz	-109
10kHz	-127
20kHz	-136
50kHz	-144
100kHz	-147

As you can see, the phase noise at 50 and 100kHz approaches the levels expected from a good crystal oscillator, and only at very close spacings does the presence of a synthesiser become apparent. **Fig. 1** shows the spectrum plot of the 6200 first conversion oscillator, and if you compare this with plots in previous articles reviewing other receivers you can see that the 6200 is very good in this department.

Regular readers will know of my continued interest in the way receivers behave in real life when faced with typical sharp increases in signal levels, such as those at the beginning of a strong s.s.b. transmission. It puzzled me for a long time why some very well respected receivers sounded uncomfortable under these conditions, and it was not until I devised my simple test procedures that I began to see the effects of signal overload at the start of such transmissions. It has to be said that receivers using d.s.p. derived a.g.c., unless they also have some form of analogue a.g.c. system, overload quite badly because of the time interval caused by the d.s.p. processing time which delays the application of gain control to the already present input signal. The worst case of this was demonstrated by the Collins 95S-1 which gave out such a 'squawk' at the start of each speech syllable that it sounded like a demented cockerel with a hot poker up it's tail-end. I expected that the all analogue 6200 would perform quite well in this test, and I was not disappointed. The audio output from the 6200 in slow, medium and fast a.g.c. settings when hit by a signal increase of 50dB at the antenna can be seen in **Fig. 2**, **Fig. 3** and **Fig 4**. There is, to be accurate, a sign of a spike in fast and medium a.g.c. settings, but none at all in the slow setting, and the spike was virtually unnoticeable to the ear. Best performance of all was with the a.g.c. switched off and the i.f. gain reduced, and even with the i.f. gain at maximum the 6200 behaved well as you may see in **Fig. 5**.

MHz	Mode	Bandwidth (kHz)	Sensitivity (dBm)
28.500	u.s.b.	2.4	-114.5
14.200	u.s.b.	2.4	-114.5
10.200	u.s.b.	2.4	-116
6.200	l.s.b.	2.4	-116
2.200	l.s.b.	2.4	-116
0.900	l.s.b.	2.4	-117
0.100	l.s.b.	2.4	-114.5
0.060	l.s.b.	2.4	-112
0.010	l.s.b.	2.4	-110
28.500	a.m.	6	-106
14.200	a.m.	6	-107
10.200	a.m.	6	-107
6.200	a.m.	6	-107.5
2.200	a.m.	6	-108
0.900	a.m.	6	-108
0.100	a.m.	6	-106
0.060	a.m.	6	-103
0.010	a.m.	6	-100

Overall Feelings

The Eddystone 6200 is an interesting receiver in that it comes from a company with a long history of involvement in h.f. receivers, and yet it represents a different approach to that previously used by Eddystone. It would be interesting to know some of the development story, and I have no doubt that out there are people who know a great deal about this and may be prompted to tell me. In many ways the 6200 shows the best of design prior to the introduction of d.s.p. technology in h.f. receivers and as a result it performs extremely well indeed. Much of the instruction manual carries dates in the mid to late 1990s and this seems to ring true with the design techniques incorporated in it. As an h.f. receiver for the enthusiastic listener it performs very well indeed, and anyone reading this magazine would be delighted to have it in front of them. The recovered audio is extremely pleasant to the ear, all the controls work as they should, the firmware is well integrated with the overall operation and the remote control facilities, although I haven't covered them in this brief review, are very comprehensive and well explained in the manual. Anyone accustomed to using RS-232 protocols would find software writing easy, and the results would be very satisfactory.

Proud Heritage

For someone in my fortunate position of having had my hands on many of the top flight receivers of the last three decades, it becomes quite difficult to give a definitive answer to the question "which one was the best?" because I would have to define "best for who?" There are listeners for whom f.s.k. facilities would be of paramount importance, whilst others would want to resolve narrow band a.m. for beacon listening - actually, I forgot to mention that recovery of low frequency NDBs was a dream with this receiver. It has a very low noise background level and the r.f. performance is maintained right down to its bottom frequency limit so for l.f. and m.f. DXing this would be perfect, and a great step forward for those who currently use rather older l.f. receivers for this purpose. My reviews have tended to reflect my own particular tastes and needs, and have therefore concentrated on that mythical creature 'The general listener', for that is what I am. There have been receivers which gave me an overall pleasurable feeling, and the top of that list would be the RA1792 The Eddystone 6200 comes into that top bracket as far as I am concerned, and I would be delighted to have one for my own use. I do not know the selling price, but it will be out of reach for most of the readers of these pages, but like the best of car magazines, it does no harm to find out what an Aston Martin feels like to drive, even if the reader may never own one. The 6200 and the RA1792 make me feel that there is much of which to be proud in our English engineering heritage.

Now I suppose someone will write and say that they were both designed elsewhere!

Happy listening.

SWM

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