SIGNAL

R535

VHF / UHF RECEIVER

OPERATING MANUAL

Display.

The high contrast liquid crystal display shows one or more of the following, depending upon mode of use.

- Mode of operation (manual, scan, or search)
- Memory channel number
- Frequency to which receiver is tuned
- An underline cursor below channel or frequency numbers

The underline cursor only refers to the number under which it is is displayed, and can be moved left and right by the left arrow and right arrow keys so as to coincide with any number you wish to change. Once positioned under the number to change, the number can be increased or decreased by the up arrow or down arrow keys

Shift.

This key shifts the functions on several other keys, and in use is held down whilst a second key changes one of the receiver operating functions. This will be further described in the detailed operating instructions.

Mode.

Self explanatory; this button change the operating mode of the R535 from manual, to scan, to search.

Enter.

This button transfers information set up by the user on the display into the microprocessor control, and tells the receiver to change to the new frequency etc.

Sql.

This is the adjustable squelch control, and its function is to set the level at which the receiver is muted in the absence of an incoming signal. To set the squelch level, select a frequency which you know will be unoccupied, turn the "Sql" knob fully anti-clockwise, turn up the volume until you can hear the background noise, and turn the "Sql" control slowly clockwise until the background noise is just muted. This is the most sensitive setting for the squelch system, and it is possible that bursts of incoming noise may open the squelch and produce a noise from the speaker. In this case a slight clockwise advancement of the squelch control will increase the squelch threshold and

reduce the annoyance. It will at the same time increase the level of incoming signal which is needed to overcome the squelch system, and result in very weak signals being lost.

Vol/Off.

This is the combined on/off switch and volume control. The fully anti clockwise position switches off the power to the receiver. Clockwise rotation switches on the receiver and increases the volume. If you have previously set the squelch control to mute the background noise, remember not to turn the volume too far clockwise, because when a signal appears it will sound loud enough to hurt; particularly if you are using headphones.

REAR PANEL

Aerial socket.

This is of a type known as an SO239, which takes the commonly available PL259 plug, and is used for connection of a suitable external aerial for mobile or fixed station use. The standard PL259 is designed to fit on to half inch diameter cable, but reducers are available if smaller diameter cable is used.

Aerial switch.

This is located close to the aerial socket and has two positions. If pushed towards the outside edge of the receiver, the rear panel socket and internal whip aerial are disconnected, and the front panel socket is used. If the switch is pushed towards the centre of the receiver, the front panel socket is disconnected and the rear panel socket and internal whip aerial are connected.

Display dimmer switch.

This is situated in the middle of the rear panel and is used for dimming the display when using the optional portable battery pack, so as to reduce current consumption.

Remote control socket.

This DIN socket gives access to the RS232 control port of the R535 for computer control. For details of the operation of the computer interface, a separate instruction will be available later.

External Power Supply.

This is the power input socket for the receiver. The R535 requires 12 volts dc for operation, and this may be derived from a suitable mains power unit, car battery, or the BP535 rechargeable battery pack. Extreme care should be taken when connecting the power, as damage may occur to the receiver if the power is reverse polarised. THE CENTRE PIN IS POSITIVE, THE OUTER RING IS NEGATIVE.

Mains power supply.

We recommend the use of our own PS12 supply, which connects straight into the R535, but any power supply capable of delivering 12 volts dc smoothed and regulated, at about 300 mA will be suitable, PROVIDED THAT CORRECT POLARITY IS OBSERVED.

Mobile operation.

The battery lead provided is coded to show correct polarity. When installing in a vehicle, be sure that the chassis of the vehicle is connected to the negative side of the battery, otherwise damage may occur due to an earth loop via the coaxial cable if a vehicle mounted aerial is used.

Portable operation.

The R535 is an ideal receiver to use as a portable because you can carry all your favourite frequencies in memory channels, or programme the frequencies you are going to use before going to the air show or whatever. Dry batteries may be used, but the rechargeable Nickel-Cadmium battery pack type BP535 is much more cost effective in the long run, since you can expect to get at least 500 charge/discharge cycles from it. Work out the cost of 500 dry battery packs and you will see the advantages. The BP535 requires a mains powered charger, type CH535, and for protection of your receiver out in the open, the LC535 carrying case is a wise precaution. Suitable aerials for the R535 in portable operation would be the RB144 flexible helical, or either of the high performance TW535 or BNC6 telescopic whips.

Using your R535

Having unpacked the R535, locate the telescopic whip and note that the base is threaded. Insert this end into the hole in the top cover of the receiver. The aerial will go in about an inch before meeting an internal bolt. Carefully screw the aerial on to this bolt, and when secure, pull out the whip sections carefully to their full extent (about 24 inches). Make sure that the aerial switch

on the rear panel is set towards the centre of the receiver. Plug in the power source on the rear panel, checking that the polarity of the supply is correct.

Turn the squelch control fully anticlockwise and turn on the receiver by rotating the volume control clockwise. Set the volume to a comfortable level, then set the squelch by rotating the squelch control clockwise until the background noise just disappears.

Manual operation.

When first switched on, the display panel will normally be showing that the receiver is in manual mode (MANU on the display), a channel number such as 22ch, and a frequency which may be in the VHF or UHF band depending on what band the receiver was last used on. You will see that one of the numbers on the display is underlined, and this can be either under a channel number digit or any digit in the frequency display. If the receiver was switched on with the underline beneath a frequency digit, the channel display may show a double question mark (??), which simply means that the frequency showing has not been entered into any of the memory channels. If by chance the display is not showing "MANU", press the key marked "mode" until you see "MANU" come up on the display.

Now practice moving the underline from number to number using the two keys marked with horizontal arrows. To change frequency, start with the underline below the digit representing tens of MHz. Now use the keys marked with vertical arrows to increase or decrease this number to the value you require; for example if you want a frequency of 129.9 MHz, you move the tens of MHz digit to read 2. Now move the underline to the next digit along and set that likewise; and the next digit, and so on until you have the frequency you require in the display. To change from VHF to UHF and vice versa you hold down the "SHIFT" key and press the appropriate "VHF" or "UHF" button.

Whatever frequency is showing on the display will be received, and there is no need to press "ENTER" or any other key. Now you can decide what frequencies you wish to store for future use and put them into memory. Note that memory entry and lock-out are done with the R535 in the "MANU" mode, and not in the "SCAN" mode.

It is a good idea to make a list of the frequencies you intend to enter so that you can assemble them in some kind of logical order which suits your application. Having made the list, choose the first channel you wish to fill, and by use of the underline cursor set the channel number on the display. Then move the underline cursor to the frequency display and set the frequency you want to put in that channel. Having set the frequency, hold the "SHIFT" key down, press "ENTER" and the frequency will be transferred to the channel shown on the display.

You do not need to enter frequencies in any particular order, and you can fill groups of channels as you see fit; for example you can allocate channels 40 to 60 for all military frequencies, and all channels from 10 to 20 for civilian ATC, and so on. It's entirely your choice.

Having entered all the frequencies you can think of (and it's unlikely that you will have filled all 60 memories), you can begin to use the R535. For manual operation, all you have to do is stay in the "MANU" mode, move the underline cursor to the channel number units digit, and step through the channels using the up arrow and down arrow keys. As each channel is selected, the frequency in that channel will show on the frequency display and the receiver will be automatically tuned to that frequency. If you come across any channels which are vacant, the frequency will show 108 MHz.

That's all very well, but it's a bit tiring stepping through all these channels using the up and down arrows, so how about scanning them automatically ? On to the "SCAN" mode.

Scanning and seeking (there's a difference)

Assuming the R535 is in the "MANU" mode, give the "MODE" key another prod and it will change the display to read "SCAN". STOP - that's far enough for the moment. You will see that the display also shows two channel numbers with a horizontal arrow between them. The left hand number is the channel at which the scan will start, and the right hand where it will finish. Actually the scan carries on round, starting at the left channel, on to the right channel, and starts again straight away at the left channel so that you get continuous scanning.

Now, using the underline cursor as in manual mode, you can select the start channel and finish channel - remember my advice to group your frequencies together in adjacent channels. Having selected start and finish, simply press "ENTER" and the R535 will leap into action, scanning channels at an amazing speed. As soon as a signal is detected on a channel, the receiver will stop scanning and let you listen to it. When the signal disappears, the receiver will wait a second or so and leap off into scanning again.

MOST IMPORTANT. The scan will not work unless the squelch control has been set to remove background noise. If the squelch is open, the R535 simply assumes that there is a valid signal present and will stand still for evermore.

It is normal practice to start on a low channel number and scan to a higher number. However, since someone is sure to ask the question "What if I put the higher channel number in the left hand slot on the display?", the answer is that the receiver will do exactly what you have told it to do; for

example if you put channel 40 as the start channel, and channel 10 as the finish, the R535 will start at 40, scan all the way to 60, jump to 01, scan all the way to 10, leap the gap from 10 to 40 and start again. Logical really.

Next question. "What if one of the channels you are scanning has a continuous transmission on it and thereby stops the scan?". The R535 can cope, because there is a lock-out facility which allows you to tell the scan system to bypass any channel in the scan sequence. To bypass a channel, return to the "MANU" mode, select the channel number to be bypassed, hold down the "SHIFT" button and press the up arrow key. The channel number on the display will now be enclosed in brackets, which indicate that it will be bypassed in the scan mode. Any number of channels may be bypassed in this way. To cancel the bypass, simply return to the channel, hold the "SHIFT" key, and press the up arrow again. The brackets around the channel number will now disappear, and the channel will be restored to the scan sequence.

Seek Operation

The seek mode of operation allows you to automatically search through a band of frequencies for signals when you do not know if any are occupied. You can tell the R535 at what frequency to start the search, the frequency to end it, and also the frequency increments to use when searching.

Press the "MODE" key until the display shows "f-start" along with a frequency. Alter the frequency by use of the arrow keys to that desired, and press "ENTER". The display now shows "f-end" along with a frequency. Alter the frequency by using the arrow keys until you have selected the end frequency desired, and press "ENTER". The display shows "f-step" followed by the stepping frequency which should normally be set to 0.025 MHz (although 0.100, 0.050, 0.025, 0.010 and 0.005 may be chosen). The steps are changed by use of the arrow keys as before. Pressing "ENTER" once again, starts the scan between the chosen limits provided that the receiver is squelched.

Note that the seek facility can only take place between frequencies in the same band, i.e. between two VHF frequencies, or two UHF frequencies. You cannot ask the R535 to seek between a VHF frequency and a UHF frequency.

A neat trick with the seek mode is to first select an empty channel in the "MANU" mode before going to "SCAN" and f-SEEK. Then, if the receiver finds an interesting signal whilst seeking, you simply hold down the "SHIFT" key and press "ENTER", and you will find that the frequency of interest has been transferred into the previously chosen empty memory channel.

Helpful Hints

The experienced Airband listener will be aware of the following, but to someone just starting out the hints may be of help.

Frequencies

In addition to the local airfield frequencies, there are "en route" frequencies, radar advisory and information frequencies. Any of the popular books devoted to Airband listening are a useful source. The private Company frequencies between 131.4 MHz and 131.95 MHz are worth scanning. Some services such as VOLMET or ATIS are continuous voice transmissions and hence not suitable for scanning because the scan locks on to them every time, so if you want these, put them in unused channels and go to them when required by manual operation. It is well worth while tuning +/-5 or even 10 KHz on these ground services just in case the frequency is offset.

Aerials

A great deal may be written on this subject - in fact I can think of several thick tomes devoted to theory and practice, but the average listener can get by on a few fundamentals. The first basic is that aerial measurements are in wavelengths rather than feet and inches and the higher the frequency, the shorter the wavelength. Hence a standard "1/4 wave" aerial for the long wave is some 1/4 mile in length. The same aerial for 27 MHz CB is about 25 feet, for the middle of the civil Airband (or 125 MHz) about 2 feet, and for a 350 MHz military installation about 9". Ideally, the aerial should be designed for a specific frequency and in commercial practice where only one frequency is used, this is what is done. For more than one frequency, generally speaking more than one aerial is desirable - hence police cars which appear to be festooned with up to four different aerials, or, for that matter, Rugby, where many different species of aerial cover vast areas. For the listener, however, one must temper desirability with reason, and come up with some ideas for optimum performance without incurring marital strife or neighbourhood warfare.

Fixed Station Aerials

The first consideration is whether or not an outside aerial is required. If you are receiving all that you can reasonably expect to receive on the extending whip supplied, there is little or no point in doing anything further, but if there is a signal which you can hear but not copy 100%, then an outside or loft aerial will be an improvement. Bearing in mind the "line-of-sight" limitation, the higher up you can get it, the better.

A Home-made Aerial

Take 2-24" lengths of 3-core mains cable, strip the outer cover for 16" from one end. Leave one core the full 24", another 14" and the third 8". Bare the other end for about 1/2" and twist all three cores together. Repeat for the other length of cable, ending up with two identical pieces, which can be pinned up vertically in the loft separated by about 1/4". The final stage is to connect the aerial to the receiver via 50 ohm coaxial cable. At the aerial end, the centre connector of the coaxial cable joins the twisted ends belonging to the mains cable pointing upwards, and the braid joins the twisted wires on the mains cable pointing downwards. Run the coaxial cable horizontally for a few feet before it goes off to the receiver so that the whole thing looks like a large 'T' on its side.

At the receiver end of the coaxial cable, a PL259 plug (and possibly a reducer) is required. The centre conductor is soldered to the centre pin of the plug and the braid soldered to the plug body. It may be more convenient to have the supplier of the coaxial cable do this for you at a small extra charge.

This aerial will give a good account of itself on both the Civil and Military air band. If you don't fancy a D.I.Y. installation, there are ready-made aerials such as the Lowe L.A.B. which is a standard civil airband ground-plane aerial with an adequate performance on the UHF. band. For improved performance on the UHF. band it is necessary to install a "discone" type of aerial such as the Revcone or D130, although these have the disadvantage of being larger and more expensive than the simpler and cheaper Lowe L.A.B. Finally, there are a range of VHF/UHF active aerials on the market. These have the advantage of compactness, good performance (usually with gain) over the entire width of both bands, and are particularly useful when there is a long length of coaxial cable between aerial and receiver. The snags are firstly cost and secondly they tend towards interference from nearby transmitters (Police, Fire, Business Radio, etc.)

Before leaving fixed station aerials, it is worth considering the sort of coaxial cable to be used. Low loss TV cable may be used, provided it is of the best quality, but like the active aerial, is prone to external interference. The two most widely used coaxial cables for airband listening are either UR67 or UR43. The first is a heavy duty, low loss cable about 1/2" dia which solders directly into a PL259 plug, but is rather heavy. UR43 on the other hand is much lighter and cheaper, only 1/4" diameter (requires a reducer for the PL259 plug) but suffers from higher losses. As a rough rule, if the main interest is the civil aircraft and the length of cable less than 50 feet, UR43 is economic. If signals are strong, then again UR43 is acceptable. But in cases where the UHF. band is of interest, or in cases where signals are weak, it becomes economic to specify the more expensive UR67.

Mobile Aerials

When the R535 is used mobile, it is essential to use an airband aerial on the outside of the car, such as the Lowe MG125 or Revco Airband whip. Mounting may be either by a basemount which is fitted to a wing or roof of the car, but which involves drilling a hole in the car, or by a gutter mount which clamps onto the gutter of the car. This latter involves no drilling, is a simple clamp, but attracts vandals. Undoubtedly, the best installation is by means of a magnetic mount in the centre of the roof which can be removed whenever it is deemed advisable.

Portable Aerials

For visiting Air Shows, etc. the R535 makes an ideal companion when fitted with the optional re-chargeable battery pack (dim the display lighting with the rear panel slide switch). There are two possible aerials - a full sized extending whip or a short, flexible helical. The latter, being short and flexible is very convenient, plugs straight into the BNC socket, doesn't catch on bushes, doesn't poke fellow spectators in the ear and doesn't break when you turn sharply and hit something! Unfortunately, being short it is not as efficient as the full size extending whip, but at an air show, signals are usually very strong, so efficiency is of less importance.

Finally, a few Do's

Do - always use the correct plugs, otherwise damage and expensive damage inevitably follows.

Do - use the proper power supply, but if you must use an alternative be absolutely sure it can deliver a REGULATED 13.8 vdc, fully smoothed at up to 300mA.

Do - check polarity. The centre pin is POSITIVE and the outer ring NEGATIVE.

Do - use the Search facility, but don't try and cover too big a range, otherwise you miss short transmissions. Cover a bit at a time, let it scan away until you are sure you've logged everything worth logging. Hope and pray that in some cases you can hear both sides of the transmission, ground as well as air.

Do - remember that you can search in 25, 50 or 100 KHz steps. Although the airband is officially 25 KHz channels, the majority of signals are still 50 KHz apart, so it is not a bad idea to search initially at 50 KHz steps because you can search the same slice in half the time.

Do - when listening to an unlogged ground station, other than an airport, tune up and down.

Do - keep your receiver clean, and dry. If, at an airshow you get caught in a heavy shower, do spare a thought for your R535 and tuck it under your coat; the carrying case, whilst providing a good deal of protection is not intended to be waterproof.

Do - remember that the memory contents are retained by an internal battery. At intervals of one year, or if the set will not retain its memories, take off the outer cover and check the memory backup batteries. These are mounted in a normal battery holder and are easily replaced. Be sure to use the same type of battery when replacing. (2 x Duracell MN9100 or equiv.)

Do - Remember that the "Hundred MHz" digit on UHF is changed by stepping the "Tens of MHz" digit on from "9".

Good listening and if you have any problems or need any advice, the Importers are only too willing to help in any way they can.