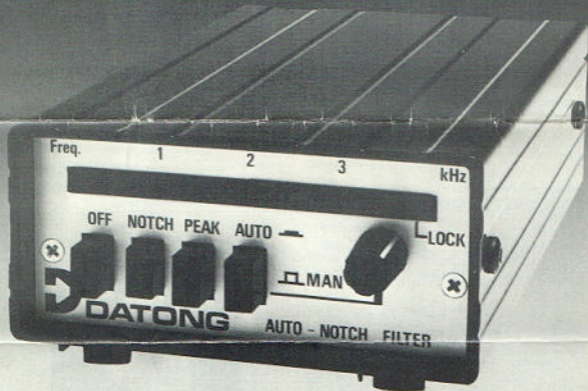


DATONG

ELECTRONICS LIMITED

AUTOMATIC AUDIO NOTCH FILTER PLUS CW FILTER

Clears tune-up whistles from SSB automatically



MODEL ANF



OPERATING INSTRUCTIONS

MODEL ANF: USER INSTRUCTIONS

Connecting up

Connect the "input" jack of Model ANF to the external speaker jack of the receiver or transceiver and connect a loudspeaker to the "output" jack of Model ANF. In both cases the centre pin of the connector is 'live' and the outer goes directly to chassis.

Suitable jumper leads can be made from the two leads supplied with Model ANF. These have a phono plug fitted to one end only. The other end should be fitted with a connector to suit the receiver and loudspeaker. The shielded wire has its centre conductor connected to the centre pin of the phono plug and its braid to the outer.

A power source of between 11 and 15 volts DC should be connected to the "supply" jack using the plug provided. Connect positive to the plug centre and negative to the plug outer. If the supply is connected backwards the filter will not work but will not be damaged.

The power supply need not be highly stable and a low-cost unstabilised unit (such as the Datong MPU series) will be quite suitable. If a supply with a high current capability such as a car battery is used, it is a good idea to fit a 1 amp fuse in the power lead to avoid serious damage in the event of an accidental short circuit.

The input impedance of Model ANF is 100K and is suitable for direct connection to the loudspeaker or headphones terminal of any receiver. The output is suitable for loudspeaker impedances of three ohms or greater. A headphone jack is provided on the rear panel.

Initial Testing

Having switched up the system as described above and with Model ANF switched "OFF", the receiver should work as normal through the external loudspeaker. If it does not do so re-check the wiring to the two jumper leads.

Now apply the power source and switch on Model ANF by pressing "PEAK". One of the display LEDs should light up. If it does not do so, check the power supply wiring and its polarity.

If all the above instructions have been successfully carried out, the installation is complete and the filter is ready for use.

Automatic Notching

Select the automatic notch mode by pressing the "NOTCH" button and the "AUTO" button. No other adjustments are required.

Tune the receiver to clear speech or background noise and the display should sweep up and down over the full range. There will be no easily audible sign that the sweep is occurring yet in fact a narrow notch filter is being swept over the received audio signal. It is because the notch is so narrow that its effects are inaudible.

Now tune the receiver in SSB mode until a strong steady audio tone is received (if necessary, use the signal from the calibrator or an off-tune AM station). The display will stop sweeping and will give a steady reading which indicates the frequency of the tone. At the same time, the right hand LED (labelled "LOCK") will illuminate to indicate that the filter has locked onto an interfering signal.

When the "LOCK" lamp is on, the incoming tone is being notched out by the filter and will not be audible. You can check the effectiveness of the filter by pressing both the "NOTCH" and "PEAK" buttons together. This puts the filter in the "BYPASS" mode and you will hear the unfiltered signal from the receiver.

Notice that the notch depth is good enough to remove even very loud tones.

Now find a weak tone and repeat the exercise to demonstrate that the filter will lock onto even very weak tones.

While the filter is locked onto a tone try selecting the "PEAK" mode. This time you will hear only the interfering tone. Then try retuning the receiver slightly so that the interfering tone changes in pitch. You will hear the filter track the tone if the retuning is done very slowly, whereas if the frequency is abruptly shifted, the filter will lose lock and perform a sweep before relocking.

The recommended method of using Model ANF is to leave it permanently connected in the auto-notch mode. It will then respond fastest to any sudden tone such as a tune-up whistle which may appear.

Manual Notching

If more than one interfering tone is present at the same time, the filter may choose to lock onto the 'wrong' one. It will in fact lock onto the first tone it finds during a sweep. This may or may not be the most annoying one to the operator.

In such cases, it is better to select the manual tuning mode ("AUTO" button out). You can then tune the notch onto the chosen interference using the manual tuning knob. You only need to tune to within about 100 Hz of the tone; the automatic system then fine-tunes the filter for best notch depth.

Tuning as described above is easy if the interference is strong but if it is weak it may be easier to peak up on the interference itself (using Model ANF as a CW filter) and then switch to "NOTCH". To do this, select "PEAK" mode (with the "AUTO" button still out) and tune for maximum sound from the unwanted tone. You can then switch straight to "NOTCH" mode and the tone will be removed.

Frequency: Adjusting the "NF" slider will not affect the lower frequency limit (but see below).

When "NOTCH" and manual tuning are both selected, the filter actually performs the same job as in the full automatic notch mode but with the difference that the automatic sweep covers a much narrower range. You may have noticed that often as you manually tune the filter in the "NOTCH" mode, two adjacent LEDs will flicker together. This flicker simply represents the rapid sweeping of the filter over its reduced range. This technique makes the filter as easy to tune as if the notch were much wider, yet the rejection notch remains very narrow.

Even this limited sweep is suppressed when "PEAK" is selected so as not to interfere with CW reception.

CW Reception

Select "PEAK" with all other buttons out and set the filter to your preferred listening frequency. Normally this will probably be in the region of 1 kHz. You can then tune the receiver as normal to the particular CW station required. The overall selectivity will be such that even very closely spaced CW signals can be separated.

The effect of the filter can be checked at any time by using the "BYPASS" mode; that is, with both "NOTCH" and "PEAK" buttons pressed in together.

Notice that as the tuning knob is rotated anti-clockwise, the filter frequency will reach its lower limit before the knob reaches its endpoint. This is normal.

Internal Adjustments

Several internal trimming adjustments are provided which allow the operating characteristics of the unit to be altered for particular purposes. To obtain access to the trimmers, remove the four case fixing screws and carefully slide out the complete PCB assembly from the rear of the case. The unit remains fully operative while exposed in this way. When reassembling the unit, slide the PCB assembly into the outer case front panel first. Note also that one end of the case is narrower than the other. If the case seems too tight, try the other end.

Lock Threshold

The lock threshold trimmer (labelled "THRESHOLD") is located close to the rear panel with access through a hole in the top PCB. Turn the trimmer clockwise to increase the sensitivity of the locking process. If the sensitivity is increased too far, the sweep may slow down too much when speech input signals are present. When the filter is set up in the factory, this trimmer is set to the midway position.

Tuning Limits

The trimmers labelled "HF" and "LF", close to the "THRESHOLD" trimmer, control the upper and lower limits respectively of the tuning range in both automatic and manual modes. To adjust the upper tuning limit select the manual tuning mode and turn the panel knob fully clockwise. Then adjust the "HF" trimmer to give the desired upper tuning limit (a clockwise rotation increases the frequency). Adjusting the "HF" trimmer will not affect the lower frequency limit (but see below).

To adjust the lower tuning limit set the tuning knob fully anticlockwise and adjust the "LF" trimmer to set the filter to the desired frequency (a clockwise rotation increases the frequency). Making this adjustment will also alter the upper tuning limit and the latter will have to be reset as described above.

Note that the frequency display is derived from a frequency-to-voltage converter and will still read correctly provided the tuning limits are within the original range of 270 to 3500 Hz.

Notch Depth

A trimmer labelled "N", accessible through a hole in the lower PCB, trims the notch depth. To adjust it, feed in a sinusoidal tone at about 3000 Hz and allow the filter to lock onto it in the automatic notch mode. Then adjust the trimmer for best notch depth. A suitable signal source for the adjustment is the receiver's calibrator - the frequency read-out on Model ANF itself allows the tone to be set to 3 kHz.

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As the HF communication bands become more and more congested there is an increasing need for counter measures over and above the facilities built into current transceivers.

The Datong Model ANF is designed specifically to solve the problem of unwanted heterodyne whistles. In addition it performs as an effective CW filter.

FEATURES

- Removes tune-up whistles or other heterodynes automatically.
- 10 LED bar-graph type display of audio notch frequency shows search-and-lock mode in action.
- Built-in fully tunable 4 pole CW filter.
- Connects in series with speaker on any receiver.
- Built to professional quality standards.

Automatic whistle removal

Heterodyne whistles on DX stations occur more and more frequently and are caused by unmodulated transmissions of all kinds, whether random or deliberate. Model ANF continuously and silently searches the receiver's audio output looking for persistent tones anywhere in the speech frequency range (270 to 3500 Hz). When it locates a tone it switches from "search" mode to "track" mode and tunes a very deep and narrow notch filter onto the tone.

The effect is dramatic. The interference simply disappears from audibility within about one second and the complete process needs no help at all from the operator.

Why automatic?

Model ANF is based on the philosophy that the primary job for you the operator is to copy the wanted signal. The more automatic the hardware the more you can concentrate on the DX.

Compared with manually operated notch filters Model ANF is a major advance. The reason is that tuning a narrow notch filter is no easy task. To be effective it has to be narrow, yet if it is narrow it has to be continually readjusted to allow for any drift in the interference or adjustments to the receiver's tuning. The result is that manual notch filters are often not worth the trouble and inconvenience of using them.

In contrast Model ANF is a delight to use. It is fast enough even to take most of the annoyance from random "tuner-uppers". It will also track drifting interference sources—over the full range from 270 to 3500 Hz if necessary. Remembering that every time you adjust the receiver tuning the interference also shifts, this is an important benefit.

Line of LEDs displays frequency

Although Model ANF is automatic it still keeps the user firmly in control. It does this by displaying on a line of LEDs the actual frequency of the notch filter at any instant. In the search mode the spot of light moves back and forth over the full frequency scale. Whenever the movement stops you know not only that the filter is locked onto a whistle but also its approximate frequency. By pressing both the "NOTCH" and "PEAK" button together, you can temporarily bypass the filter to hear what it would have been like without the notch.

Auto assisted manual mode

Occasionally some help from the operator may be needed. For example if Model ANF remains locked to a weak heterodyne when a second stronger one is causing more annoyance you can select MANUAL mode and tune the notch by hand onto the worst offender. Here again the frequency display is a useful feature.

However, remembering the comments in **Why automatic?**, Model ANF still provides some assistance. It features automatic frequency control with a pull-in time of about 100 Hz.

As soon as you have tuned the filter within 100 Hz of the interference it automatically tunes itself for the best notch depth.

Built-in CW filter

A very effective 4-pole CW filtering capability is provided using the "PEAK" mode. The bandwidth is chosen for best all round results (see technical data) and the centre frequency can be tuned over the full range of 270 to 3500 Hz with continuous indication on the LED display.

Compandor gives full performance at any volume setting

Since Model ANF connects in series with the loudspeaker on a receiver you might expect the performance of the automatic circuitry to depend on the receiver's volume setting. In fact the conventional solution to this would be to have a separate volume control on the ANF (as did the pioneering Datong FL1).

However two volume controls are a nuisance and for Model ANF we developed a quite different solution. We placed the complete filter circuitry in the middle of a precision "compandor" circuit.

The compandor consists of two precision automatic gain control circuits linked together. The first one, right at the input to the complete system, keeps the input to the system constant no matter how the receiver volume control is set. The second, connected at the output of the filter readjusts its output level so that any gain or loss in the first a.g.c. circuit is exactly cancelled out.

The result is that the overall system still has unity gain with unity gain at output connector to output connector and the overall volume remains controlled by the receiver volume control. Yet inside the filter and automatic tuning circuitry the signal level is always constant and the circuits always work at maximum efficiency and with maximum signal-to-noise ratio.

Quality construction

Not only the circuitry inside Model ANF is state-of-the-art. The new case design is based on a rugged yet stylish aluminium extrusion which slides over the dual PCB assembly. Built, floc soldered and tested as a single board the glass fibre PCB is snapped apart at final assembly and the two pieces (still linked by a strip cable) bolted onto four brass corner pieces as a 'sandwich'. The result is a very rigid assembly with excellent reliability.

Performance details

Overall audio gain:	unity.
Supply voltage:	11 to 18 volts DC.
Supply current:	75 mA quiescent, 400 mA maximum output.
Input impedance:	100 Ω .
Filter tuning range:	270 to 3500 Hz.
Notch depth:	better than 40 dB at 3.5 kHz.
Notch filter type:	2-pole, Q = 30, state variable.
Input threshold for correct operation:	1 mV rms (ie, well below usable listening levels).
Lock threshold:	will lock onto tones 6 dBs below noise level. Adjustable by internal preset.
Lock time:	An interfering tone will be removed within typically one second.
CW filter bandwidth:	60 Hz at -3 dBs at 800 Hz centre frequency. Filter comprises two cascaded 2-pole sections with Q's of 30 and 10.
Audio power output:	2 watts into 8 ohms with 15v supply. 1.5 watts into 4 ohms with 10v supply.
Connections:	input and output by phono jack, power supply by standard coaxial power jack, phones by 3.5 mm jack.
Functions:	OFF—disconnects power and connects input jack to output jack NOTCH—switches filter to notch mode for removing whistles. PEAK—switches filter to bandpass mode for CW reception. MAN/AUTO—selects manual tuning via knob or automatic search and lock mode. BYPASS—(press NOTCH and PEAK together) allows user to monitor the inputs to the filter.
Display:	line of 10 red LEDs shows filter frequency at all times.
Protection:	the unit is protected against reversed supply polarity and loudspeaker short circuit or overload.
Dimensions:	150 x 90 x 44 mm (5.9 x 3.5 x 1.7 inches). Feet add 4mm (0.15 inches).
Weight:	475 gms (17 ounces).



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