

FL3 INSTRUCTIONS FOR USE (TO BE USED  
TOGETHER WITH DATA SHEET FOR MODEL FL2)

Introduction

Model FL3 contains the same filters as Model FL2 plus an automatic notch filter. Instructions for operating all the filters except the auto notch are given in the FL2 data sheet which is supplied with both Models FL2 and FL3. The following notes are intended to describe the operation of the auto notch only and are therefore applicable only to Model FL3 or to a model FL2 which has been converted to Model FL3 by installation of the model FL2/A conversion kit.

Installation

Model FL3 should be wired up and installed exactly as described for Model FL2 except that the permitted power supply range is limited to between 10 and 15 volts. It is important not to exceed 15 volts since damage could be caused to the auto notch module.

Operation

The auto notch function is intended for removing unwanted tones or whistles from speech signals. The auto notch filter is permanently connected immediately before the audio power amplifier in Model FL3, but it can be by-passed by the small black push button marked "AUTO NOTCH". When the button is out the auto notch filter is by-passed. When it is pressed in the audio signal passes through the auto notch filter and whenever the filter locks onto a tone (as shown by illumination of LED to the left of the black button) the tone will be removed.

Since the auto notch filter is affected only by the black button, it may be used together with any of the normal operating modes selected by the white push buttons. Normally however, it is best to keep the auto notch filter by-passed (button out) except in "SSB" mode. Otherwise, if for example the auto notch is selected when using the "CW" mode, it will tend to lock onto and remove the desired CW signal.

To summarise:

1. When listening to speech signals using the "SSB" mode it is convenient to leave the auto notch permanently switched into circuit (black button in). Then whenever a whistle appears the auto notch will lock onto it and remove it.

2. Whenever the auto notch has locked onto a signal, the left hand LED will illuminate. This may happen even if the auto notch filter is switched to bypass. Thus when receiving CW in "CW" mode it is normal for the LED to illuminate intermittently.
3. Remember to bypass the auto notch (button out) when receiving CW or RTTY.

#### Other Points

The auto notch filter has been designed to locate<sup>e</sup> and track even quite weak signals. However, it does need a certain minimum signal (see FL3 data sheet) and if the circuit appears not to lock very successfully it may be because the volume control is turned too low on the associated receiver.

Assuming that the receiver volume control is set adequately high, the majority of annoying heterodynes will be strong enough for the filter to remain locked even despite the presence of speech. With very weak heterodynes the filter may lose lock when loud speech is present at the same time. This can be beneficial as the filter will then sweep its full range and will lock onto any other heterodyne which may be present and which may be louder and more annoying.

The auto notch filter will lock onto whichever tone it encounters first during its sweeping mode (that is whenever the lock light is off). If more than one tone is present it is possible that the auto notch will neglect the most serious whistle and remove a weaker one. In such cases it may be better to use the manual notch filter (see FL2 instructions) to remove the chosen tone. The auto notch will still be active and will be able to remove a second tone at the same time.

In some cases the filter will remove a whistle so quickly that the operator may not even realise that one has appeared. However the left hand LED will always illuminate whenever the filter is tracking a whistle. The bypass switch can then be operated if desired to check on the effectiveness of the filter.

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"How to separate the signal you want from the signals you don't want?" That's one of the most difficult problems for HF bands operators today, and one which Model FL3 is uniquely able to solve.

In one stylish case Model FL3 offers the complete solution to receiver audio processing. We believe that such a powerful combination of filtering capabilities has never before been offered in one package.

#### FEATURES

- Fully automatic notch filter for "hands-off" removal of tune-up whistles and other steady tone interference.
- Independent low-pass and high-pass filters with very steep cut-off for removing "monkey chatter" and other off-tune interference from SSB signals. Both filters tune continuously from 200 to 3500 Hz.
- Second notch filter tunes manually from 200 to 3500 Hz.
- For speech reception all four filters work quite independently giving remarkable flexibility and performance.
- A special tuning mode for CW and RTTY combines the low-pass, high-pass and pk-notch filters into a single 12 pole filter with superb skirt selectivity and with non-interacting controls for centre frequency and bandwidth.
- All functions and controls are calibrated and designed for convenient and natural operation.
- Works with any receiver, no internal connection required. Simply connect in series with an external loudspeaker or phones.
- Protected 2W output stage built-in.
- 29 IC's including the latest switched-capacitor filter technology.

#### Auto-Notch filter scans continuously

Users of our pioneering Model FL1 will confirm the practical advantages of an automatic notch filter for SSB reception. With absolutely no help from the operator the automatic notch tirelessly scans the receiver's audio output until a continuous audio tone is received. When it is the notch filter locks on and removes it. If the tone changes in frequency the auto-notch follows.

#### Shoots down tune-up whistles and heterodynes

Imagine the benefits. A tune-up whistle no longer causes any problems; after a second or two it simply drops out of ear shot. Those tiresome whistles that frequently descend on a QSO no longer cause any problem. Only the "LOCK" lamp on the FL3's panel reminds you of what you are thankfully missing.

#### Plus low-pass, high-pass and manual notch

While all this is happening you still have three other independent filters at your disposal. Imagine, for example that another SSB station starts up 2 kHz high. Instead of trying to copy through all that high-pitched monkey chatter simply turn down the low-pass filter (the right hand knob) and wipe it out.

Then perhaps a teleprinter starts up 300 Hz above your carrier frequency; a touch on the high-pass filter knob (the middle one) cures that.

Finally maybe a second whistle appears. Since the auto-notch is busy, just bring in the manual notch as well and tune it out (left hand knob).

#### Steep skirts are vital

When an off-tune SSB station interferes with a wanted SSB station very sharp selectivity is vital if the interference is to be removed without also removing too much of the wanted signal.

It is equally vital that the overall receiver bandwidth can be smoothly adjusted to match the actual prevailing conditions.

Using modern active filter technology, Model FL3 gives upper and lower passband edges which can be placed anywhere between 200 and 3500 Hz, and which are steeper even than those of high quality crystal filters.

Not only does Model FL3 beat techniques such as "IF shift" and "Pass-band tuning" on sheer performance, it has an important extra advantage: it can easily be added to any existing receiver since all the signal processing takes place in the audio output line between the receiver and its loudspeaker. And of course, it still has its unique auto-notch and separate manual notch in reserve.

#### Special tuning mode for CW and RTTY

For CW and RTTY reception remarkable separation of wanted from unwanted signals is achieved by combining the low-pass, high-pass and manual notch/peak filters into a single variable filter with no less than 12 poles. Extreme skirt selectivity is achieved so that compared with lesser filters you can use a much wider bandwidth for a given interference suppression making tuning easier and reducing ringing effects.

In addition the tuning controls are re-arranged so that the centre knob controls the centre frequency of the pass-band and the right hand knob controls the width of the pass-band.

This is highly convenient for CW and RTTY reception since one can first tune the filter to the signal and then expand or contract the bandwidth symmetrically to suit varying conditions.

#### How it works

The auto-notch function in Model FL3 uses a voltage tuned notch filter in a phase lock loop system. The filter sweeps back and forth through

its full range until lock is detected after which it tracks the signal. Special techniques combine a short lock time with the ability to stay locked to very weak signals.

Model FL3's low and high pass filters both use 5-pole elliptic function filters to give the steepest practicable rate of cut-off. A separate 2-pole notch or peak filter is used as the manual notch or peak filter.

Each of these three filters is continuously tuneable from 200 to 3500 Hz. Tuning is by linear voltage control and precision tracking between the three filters allows them to be used ganged together or independently as determined by the various operating modes.

The advanced design techniques used in Model FL3 were developed by Datong especially for use in this application. All filter sections are based on the "state-variable" technique for optimum long term stability.

#### Typical performance data

##### Auto notch filter

Filter type: 2-pole, constant Q, switched capacitor  
Tuning range: 200 - 4000 Hz  
Lock time: Depends on signal strength; typically less than one second

Notch depth: 40 dbs

Filter Q: 10

##### Low and high pass filters

Filter type: Both filters are five-pole elliptic function

Frequency range: 200 to 3500 Hz, linear tuning

Minimum stop band rejection: 40 dbs.

Rate of cut-off: 40 dbs in 500 Hz at 2 kHz, 40 dbs in 120 Hz at 500 Hz

##### Manual notch/peak filter

Filter type: 2-pole state variable, constant bandwidth

Frequency range: 200 to 3500 Hz, linear tuning

Notch width in "SSB + NOTCH" mode: 200 Hz at -6 dbs

Notch depth: 30 dbs

##### General

Bandwidth range

"CW (2)" & "RTTY" modes:

100 to 1750 Hz at -6 dbs (10 poles total)

"CW" mode: 70 to 700 Hz at -6 dbs (12 poles total)

Input impedance: 5000 ohms

Overall voltage gain: unity

Power output: 2 watts into 8 ohms with 15 v supply

1.5 watts into 4 ohms with 10 v supply

Output protection: The output stage (LM380) is short-circuit proof and over-dissipation proof

Supply current: 85 mA zero volume

400 mA max. output

Supply voltage: 10 to 15 volts DC. Protected against reverse polarity

Size: 184mm wide x 153mm deep x 44mm high (7.2 x 6.0 x 1.7 inches)

Feet add 10mm (0.4 inches) to height

Weight: 860 gms (31 ounces)

Accessories supplied: Input and output leads (phono plug to bare end), jack for DC power supply.

Optional extra: Mains power unit, AC mains to nominal 12 volts DC. MPU or MPU/1 for 240V, MPU/1A for 220V.

#### Note

Existing Model FL2 filters can be converted to the FL3 specification using the auto-notch adapter unit Model FL2/A plus hardware conversion kit (see Datong price list).

The response curves illustrated on the FL2 data sheet also apply to Model FL3.



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