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23cm LCD controller technical information – V3 software

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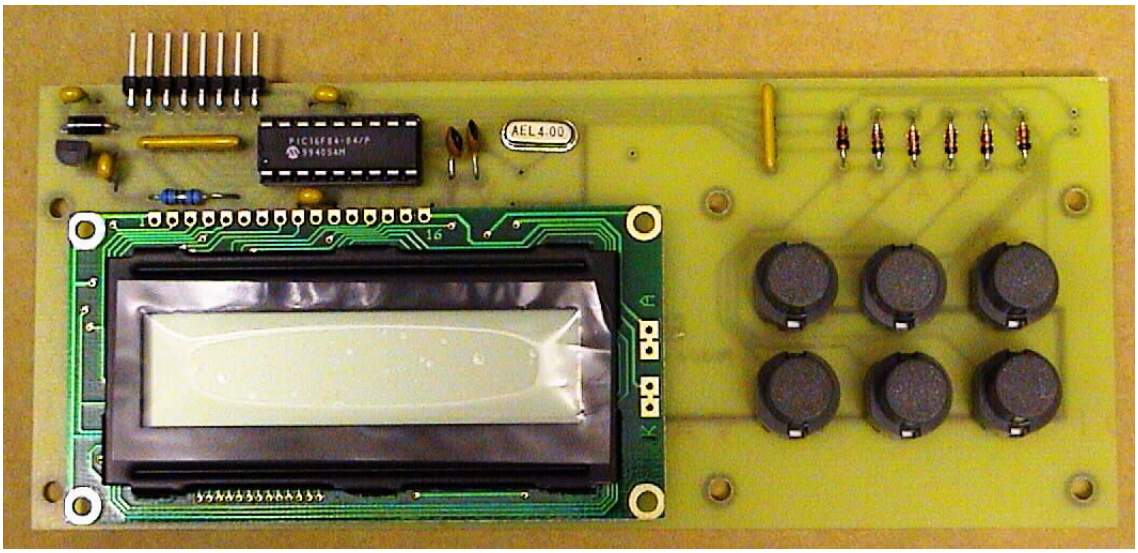


The LCD controller

Specification

The G1MFG.com 23/24cm LCD controller provides our transmitters and receivers with the following features:

	Receiver	**Transmitter**
Frequency range	800 - 1800MHz	1240 - 1320MHz
Frequency steps	125kHz	125kHz
IF offset adjustment	Yes	N/A
Number of VFOs	3	3
Automatic net to Tx frequency	Yes, selectable	N/A

Power supply requirement: 12V DC nominal (10-18V), 10mA (50mA for backlit version)

Principles of operation

The LCD controller contains a PIC microprocessor which provides control signals direct to the synthesisers within the transmitter and receiver modules, replacing the 18 pin PICs on the transmitter and receiver printed circuit boards. Because the frequency selection is no longer constrained to whatever can be coded from 8 DIP switches, it has been possible to improve the finesse of frequency selection to 125kHz, and also to extend the receiver frequency range. The transmitter is limited to the 23/24cm amateur band.

Frequency selection is now achieved by up/down tuning buttons, and the transmit and receive frequencies are displayed on the LCD display. The transmitter and receiver frequencies are controlled independently. Three VFOs are provided for the transmitter and three for the receiver.

An externally switchable ‘AutoNet’ feature automatically re-tunes the receiver to the transmit frequency when the transmitter is switched on, allowing off-air monitoring when the transmitter and receiver are on different frequencies (e.g. when using a repeater).

An IF offset adjustment is provided which lets you null out the frequency inaccuracy which some of our Gold receivers suffer from.

The controller will work fine with a receiver and transmitter, or a standalone receiver. It will not operate a standalone transmitter. Although the controller instructs the receiver to tune from 800-1800MHz we cannot guarantee that all receivers will tune to the extremes of this range.

Installation

Switch off the transmitter.

Switch off the receiver.

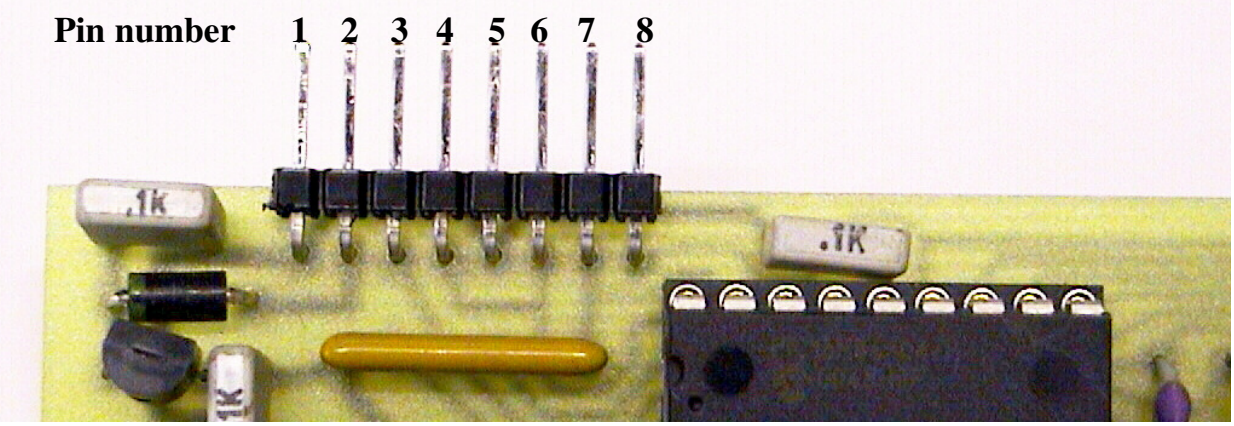
Remove the 18 pin PIC chip (if fitted) from its socket on the transmitter PCB.

Remove the 18 pin PIC chip (if fitted) from its socket on the receiver PCB.

The PICs are no longer required and may be used for your own experiments.

Identifying the connections

This is the pinout of the LCD controller (note that the pins are not fitted to all controllers)

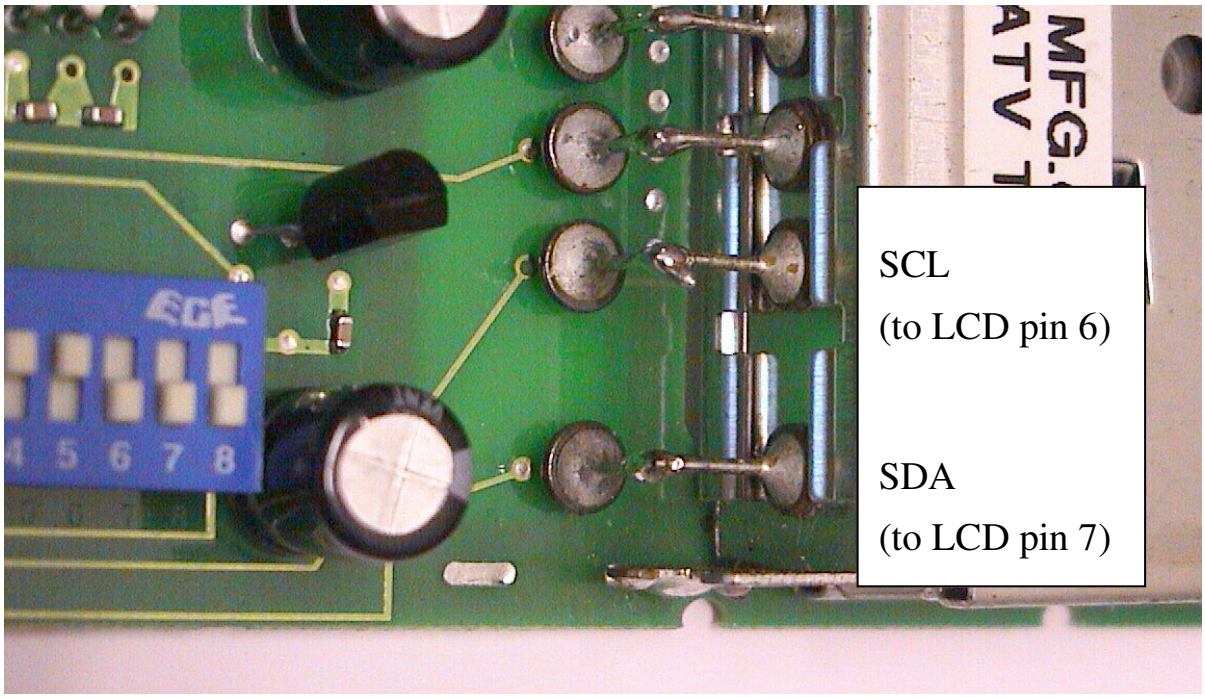


Identifying the controller pins

The pin assignments are as follows:

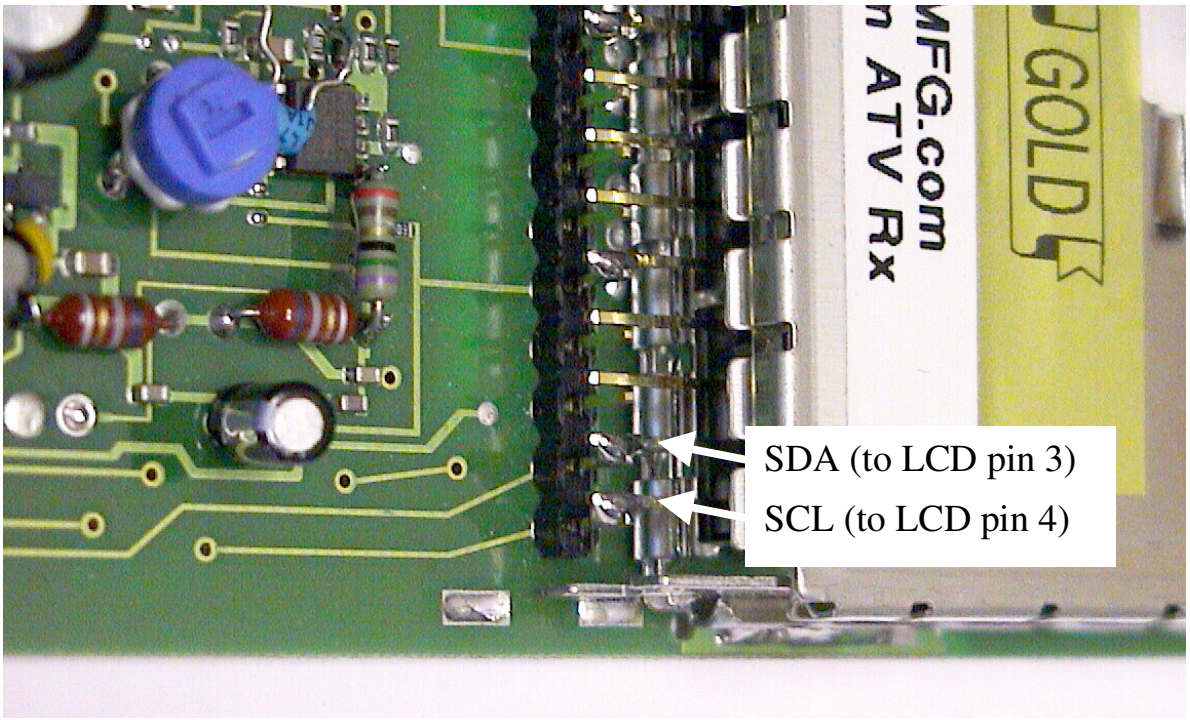
Controller pin	Function
1	0V (ground) from power supply – must also connect to Tx and Rx 0V line
2	+12V from power supply
3	SDA (serial data) to receiver module
4	SCL (serial clock) to receiver module
5	0V (ground) to transmitter (optional connection if pin 1 is connected to Tx)
6	SCL (serial clock) to transmitter module
7	SDA (serial data) to transmitter module
8	NET input (ground to activate)

Identify the SCL and SDA pins on the transmitter module. The SDA pin is the bottom one, and SCL is the next one up.



Transmitter pin identification

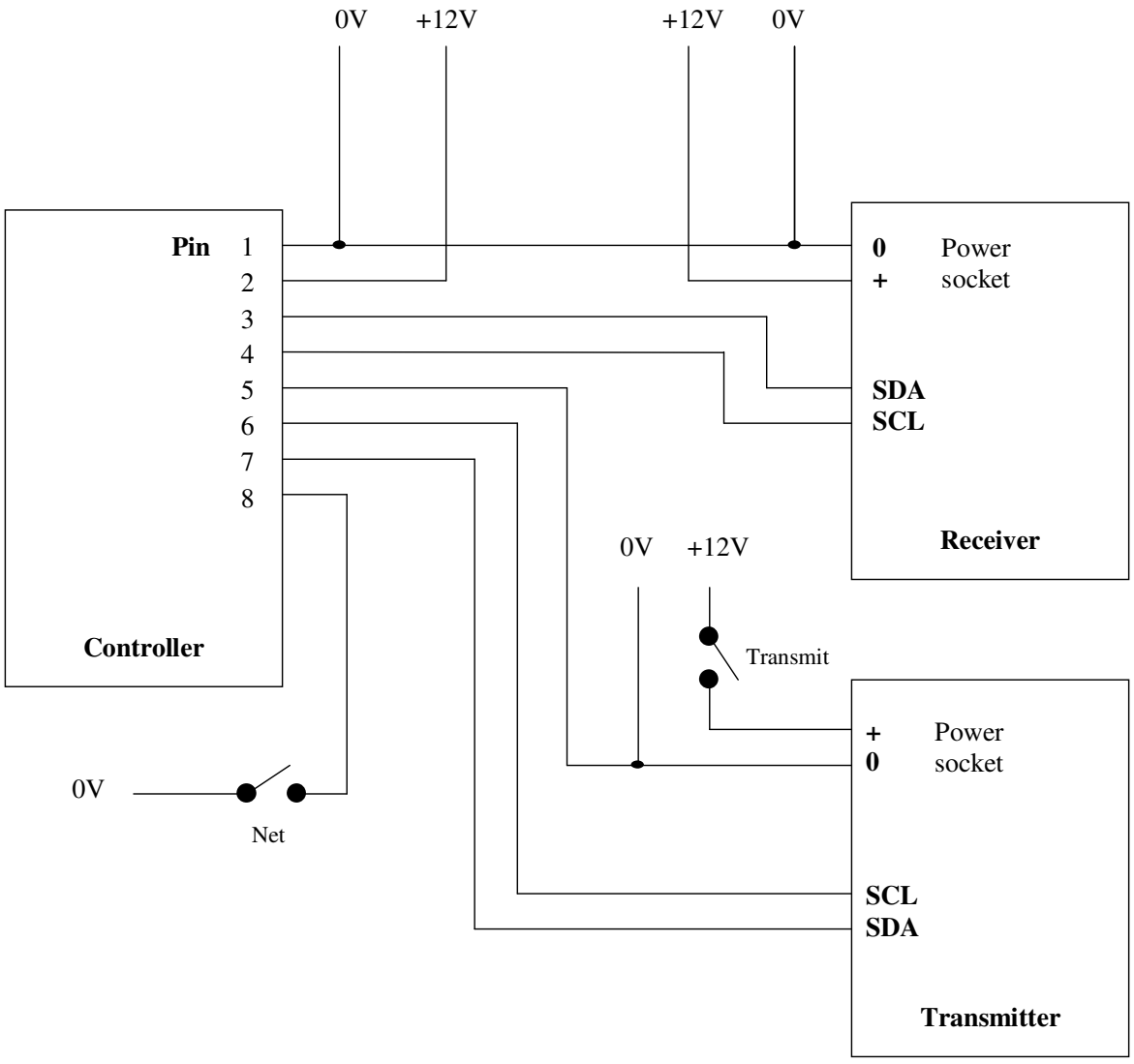
Identify the SCL and SDA pins on the receiver module. The SCL pin is the bottom one, and the SDA pin is the next one up. Note that this is the opposite way round to the transmitter.



Receiver pin identification (Platinum receiver is the same)

Wiring diagram

Wire up the LCD controller, transmitter and receiver as shown in the following diagram.



Wiring diagram

The Net switch is optional.

The controller is designed to be used fairly close to the transmitter and receiver modules. We recommend that the connections between the controller, transmitter and receiver are no more than about 1m (40") maximum. The actual maximum for reliable operation depends on the capacitance of the cable. The capacitance to ground and to each other of the SCL and SDA wires should not exceed about 200-300pF. You may be able to get away with longer interconnections by using low-capacitance cabling but we cannot guarantee success. If you need significantly longer connections, you can use Philips I^2C Bus Extender ICs, P82B715, to drive the lines. You will need four ICs – two at the controller end and two at the transmitter/receiver end. We have heard reports of people running up to 30m of control cable using these ICs, which are available from Farnell and other suppliers. At the time of writing (April 2001) the ICs cost about £5.

Note that the controller uses software to detect when the transmitter is switched on, which is why there isn't a connection between the Transmit switch and the controller board.

Important notes about your receiver and transmitter

Power supply

The transmitter and receiver require a supply of supply of 12 to 15V DC, tip positive. Reverse polarity will cause very serious damage. The transmitter gives best output power at 13.8V or more. Do NOT use less than 12V for either the transmitter or the receiver.

If your receiver has two voltage regulators mounted on heatsinks then we recommend operating it from 12V. Supplies above 14V will make the regulators run very hot.

Video and audio connections

Video and audio connections (inputs on the Tx and outputs on the Rx) are as follows:

- Yellow phono socket - composite video
- White phono socket - audio for/from 6.0MHz subcarrier
- Red phono socket - audio for/from 6.5MHz subcarrier

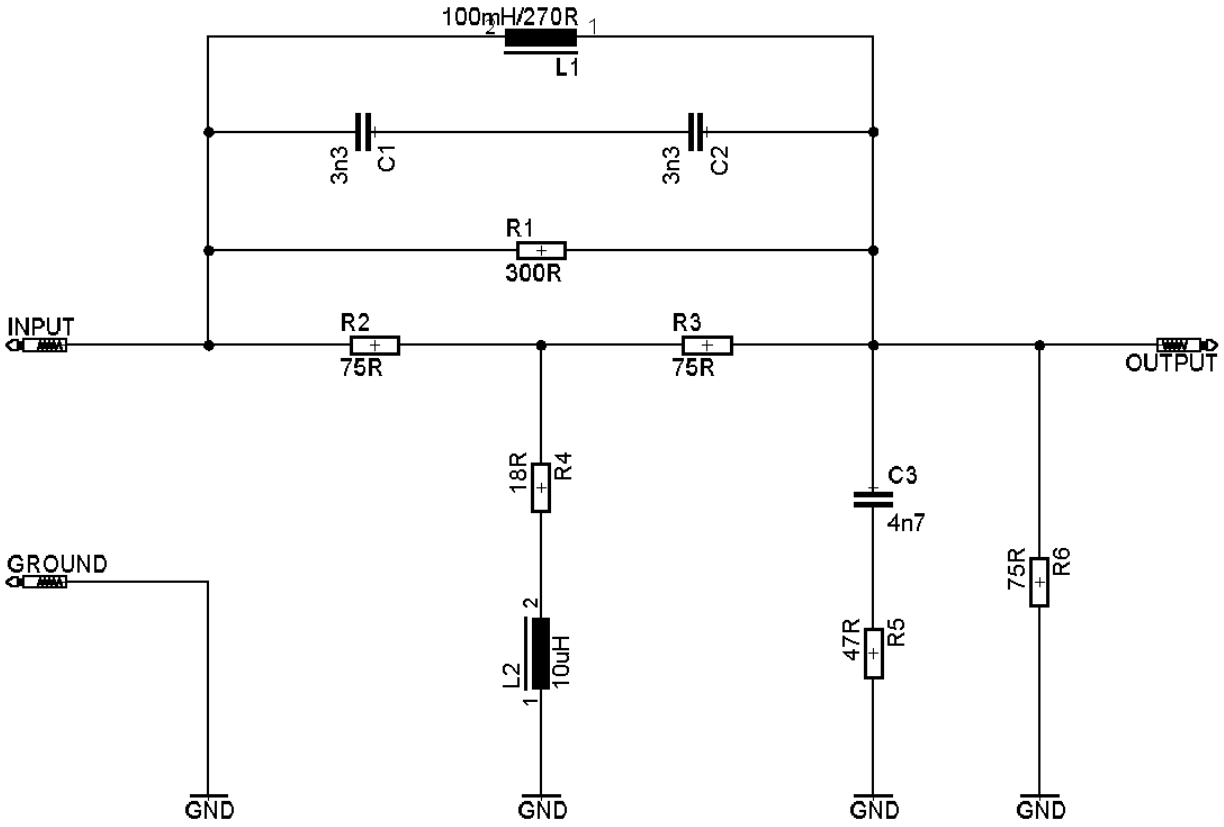
Setting up the 23/24cm transmitter

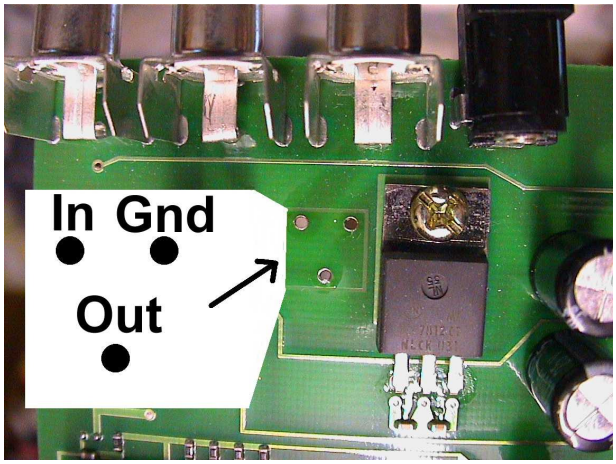
As supplied, the transmitter has an input impedance in the region of 220 ohms, and the video gain (deviation) is set using the pre-set pot on the board.

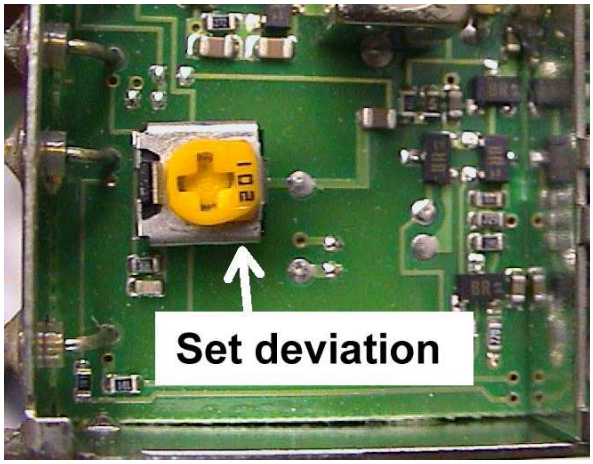
CCIR pre-emphasis

The following circuit can be used to add CCIR pre-emphasis. Remove the existing deviation preset pot to fit the circuit. Deviation can be set using the pre-set pot inside the RF module.

A full article describing this modification is available at www.G1MFG.com/pcb/.







Left : remove dev. pot to fit circuit *Right*: deviation pot inside module

Setting up the 23/24cm receiver

The pre-set pot on the receiver is the video gain control. Set it for proper amplitude video output.

If you have a Gold receiver, you can add CCIR de-emphasis using details at www.G1MFG.com/pcb/.

Special notes for Gold and Platinum receivers

The Gold and Platinum receivers are modified to improve the sensitivity and picture performance. This can have the unwanted side-effect on some receivers of shifting the receive frequencies slightly. The "IF Offset adjustment" mode described later in this document can compensate for the offset, but it's also possible to make an adjustment within the receiver RF module to remove the offset. If you're brave, open the RF module and VERY SLIGHTLY adjust the green air-spaced coil beside the larger IC. This is the video demodulator coil, and tweaking one turn by less than the thickness of a hair will bring the receiver onto frequency. Be warned: the coil is fragile, and you only need to make a SLIGHT adjustment. Tweak it too much and the receiver will go way off frequency.

There is a wire link on the underside of some Gold receiver PCBs which reduces the received noise level but also affects the colour subcarrier amplitude. Many monitors work fine, but some won't display colour. If this happens, remove the link and colour should be restored.

Operating instructions

When you switch on the controller, a sign-on display will appear briefly, which will then be replaced by a display of the transmit and receive frequencies.

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  Rx   1316.000   MHz
_ Tx   1249.000   MHz
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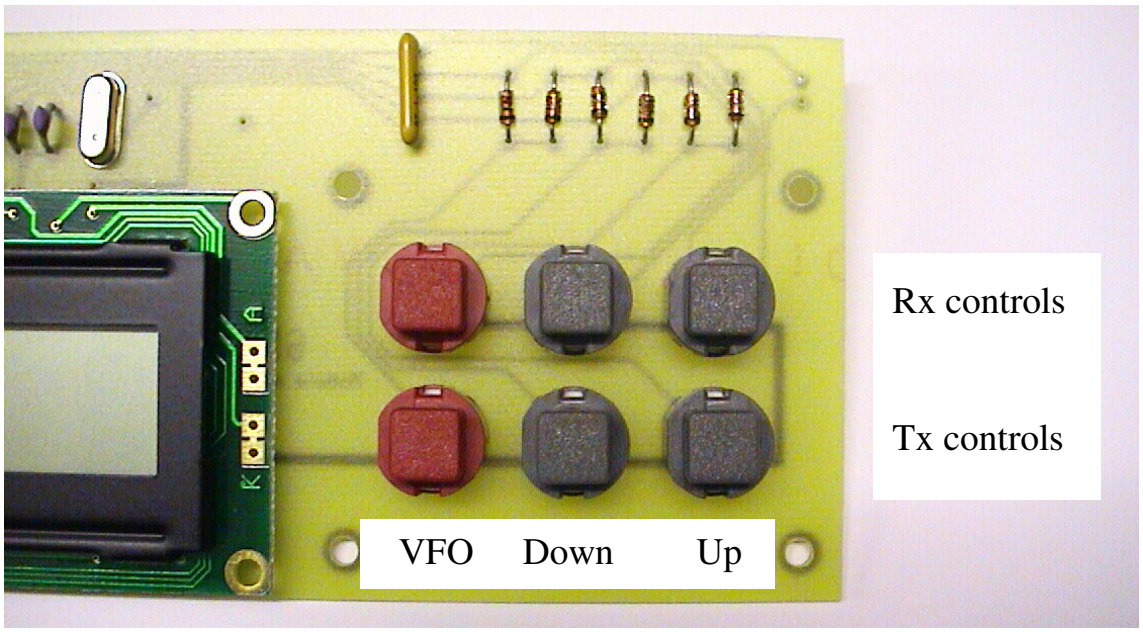
Normal operating display

Use the buttons to change frequency. Separate buttons are provided for the transmitter and receiver.



Identifying the pushbuttons

The Up and Down buttons increase and decrease the frequency. The VFO button swaps between the three VFOs. Frequency changes are immediately sent to the receiver and transmitter. The tuning rate is initially quite slow, and it speeds up if you keep a button pressed.

The controller stores the Tx and Rx frequencies in internal memory after a short delay. An underscore (_) is shown on the display beside "Tx" while the controller is waiting to store the frequencies.

- The reason for this delay is that the memory only survives a few million write cycles and is relatively slow. If the memory was written every time the frequency gets changed, it would reduce the maximum scan speed and the memory would be destroyed after a few weeks of continuous scanning.
- **Do NOT switch the controller off while the underscore (_) is showing or the controller may be damaged.**

AutoNet option

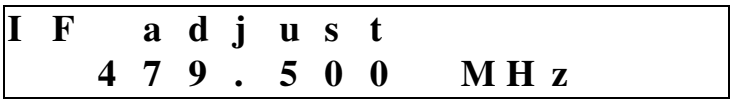
If you connect the AutoNet pin (8) to 0V, then the controller will automatically re-tune the receiver to the transmit frequency whenever the transmitter is switched on. This is useful when working via a repeater, because you will be able to see your transmitted signal. As soon as you switch the transmitter off, the receiver re-tunes to its original frequency. If you want to permanently enable this feature, you can solder a link across the two pads near the mounting hole to the right of the diodes.

IF offset adjustment

You may be aware that some of our Gold receivers have a slight frequency inaccuracy. An offset adjustment is provided so that you can trim the controller to display the correct operating frequency. This is achieved by altering the IF offset frequency for the receiver.

To adjust the IF offset,

- Use the controller to tune the receiver to an off-air signal of known frequency (e.g. a repeater). Make sure that you tune the receiver so that the display shows the actual frequency of the transmission, rather than the frequency which gives the best picture. Wait for the controller to memorise the frequency (the underscore disappears).
- Turn off the controller. Wait five seconds.
- Hold the Tx Down button pressed and turn the controller on. The display will show:



IF offset adjust mode

- Use the Rx Down and Up buttons to adjust the IF offset frequency while observing the received signal on a monitor. Adjust the IF offset for best picture quality. Usually this will be within 2MHz or so of the default IF offset (479.500 MHz).
- Press the Rx VFO Swap button to exit IF Set mode. You may have to press the button for half a second or so. The display will show "OK" and then revert to the normal frequency display. The new IF offset will have been memorised and you should find that the Rx frequency display is spot-on across the whole frequency range.
- Note: although your transmitter will be correctly on frequency, it is not recommended to use this as the source of an off-air signal for setting up the IF offset. The reason for this is that the IF offset is best set up using a weak signal – strong (local) signals will be received perfectly well even when the IF adjustment is off frequency.

There are no other hidden operation modes for the controller.