

SPECIFICATIONS:	Subcarrier Frequency	5.5MHz adjustable, FM Modulated +/- 50KHz
	Subcarrier Output	1.5v p-p Output @ 5.5MHz
	Subcarrier Filter	5.5MHz Std,-3dB BW +/- 50KHz , SFE5.5MB Optional Subcarrier Filter Frequencies available
	Harmonics	2nd 11MHz >40dB down from 5.5MHz
	Audio I/P	Line Level 1v p-p (Optional Microphone Level Input) Audio Pre-emphasis 50uS
	Power	11 – 15volts DC 35mA

DESCRIPTION & FEATURES: The Notes refer to the standard 5.5MHz EME75KIT1, but also apply to other frequency versions of the Kit. The Kit is designed as an add on sound board that should suit most ATV transmitters. The complete Audio Subcarrier circuitry is built on a single 62 X 36mm size board, & should take around an hour to construct. The circuitry consists of Audio Pre-emphasis / Preamplifier / 5.5MHz Subcarrier Oscillator, & Buffer Amplifier. The circuitry is based on previous designs, & now includes a ceramic bandpass filter to effectively attenuate harmonics of the subcarrier oscillator, providing a cleaner transmitter output. The board can also be used for other subcarrier frequencies simply by replacing the 5.5MHz ceramic filter with a different frequency type, e.g. 5.742MHz, 6.0MHz, 6.5MHz etc.

CIRCUIT: Refer to the circuit diagram. The Audio signal up to 1v p-p is fed via a 10kohm audio level trimpot and 50uS Pre-emphasis network to an input preamplifier using a TL071/ Low Noise Operational Amplifier. If required the Amplifiers gain can be adjusted by changing the value of the 2.2kohm feedback resistor between pins 2 and 6. The Audio output signal from pin 6 of the TL071 drives a LA7051 Audio FM modulator IC, which was commonly used in VCR RF Modulators. The IC uses an external 47pF NPO capacitor & a 15uH coil to produce a very stable 5.5MHz oscillator. The IC produces around 1v p-p output @ 5.5MHz on pin3 that is filtered by a 5.5MHz Bandpass Filter to effectively attenuate any harmonics before being amplified & buffered by a J310 Fet. The Fet buffer amplifies the signal by around 5x before it passes through the 150pF output capacitor for a maximum of 1.5v p-p output. The 150pF capacitor has been chosen to effectively pass only the high subcarrier frequencies, & stop the lower video frequencies from being loaded by the output of the subcarrier board.

CONSTRUCTION:

1. The PCB, (Printed Circuit Board) supplied is a tin plated board, which makes it easier to construct the Kit, & gives the finished project a professional appearance. The boards component spacings, & drilled hole sizes, were designed around the components that are used in the Kit, so no drilling or modifications to the board should be required. The single earth pad connections on the bottom of the board are plated through holes & only have to be soldered on the bottom track side of the board.
2. Follow the PCB overlay diagram & circuit carefully, by checking the components and placing them onto the board. Be careful when installing the components, as all holes in the board are plated through, which makes it difficult to remove any components if mistakes are made. **When installing the LA7051 there is not much clearance on the top groundplane side of the board which can easily short out on the components legs, if the IC is pushed in too far. Some Kits may be supplied with a 18uH coil as a substitute for the 15uH one. A smaller value of C1 is supplied in these Kits.**
3. As a modification to provide a better match on the input of the SFE5.5MB filter, a 560ohm resistor needs to be fitted between the input leg & ground. Due to cost, PC boards have not been changed to accommodate this component. Fit the resistor on the bottom of the board. Without the resistor the filters bandpass is poor causing distortion on the audio. **Refer to the circuit diagram on where it is fitted.**
4. Check your construction carefully, to ensure that you have no shorts or solder dags etc as they are a lot more difficult to repair later on when the board is mounted in a box.

AUDIO / SUBCARRIER KIT EME75

CONNECTIONS:

1. Shielded audio cable should be used when connecting to the audio input, & subcarrier output connections on the board. If the audio input level needs to be adjusted externally, simply take the 10kohm audio level trimpot off the board, & run shielded cable to an external 10kohm Pot.
2. When connecting the audio board to the EME79 transmitter, the subcarrier cable should be connected underneath the EME79 board to the audio subcarrier input connection. RF instability can occur if the cable is run across the top of the EME79 board.
3. For frequency stability, it is suggested that +12volts is connected to the board continuously. Only the power to the transmitter & or poweramplifier needs to be switched.

TUNEUP & TESTING:

1. You should now be at a stage that you are ready to test the board. First make sure that the 78L08 Voltage Regulator & 1N4004/7 Protection Diode have been fitted correctly before applying power to the board. It is also a good idea to use a multimeter & check that there are no shorts on the input & output of the voltage regulator to earth before applying power.
2. Using a suitable 11-15v powersupply with current limiting or a fuse, apply power to the board & check that it draws close to 35mA as shown in the specifications.
3. Connect an Oscilloscope to the output of the subcarrier board. Make sure that the the subcarrier trimpot is set to about mid position. Adjust the 15uH coil for maximum output on the Oscilloscope. The output level should be around 0.5volts p-p. **Any adjustment of the 15uH Coil should be done with the correct plastic adjuster to avoid damaging the ferrite core. Metal adjusters will detune the coil & can damage the core.**
4. An alternative method of adjustment, is to connect a frequency counter to the input of the 5.5MHz ceramic filter, or monitor the signal on a HF receiver. Allow the oscillator to stabilize for a few minutes before adjusting the frequency. If your counter is erratic, this could mean that you may not have enough level to trigger it for a stable reading, so try monitoring the signal with a HF receiver instead. Carefully adjust the 15uH Coil for a frequency of around 5.5MHz. The adjustment can be a bit touchy, but just aim at this stage to getting it close to 5.5MHz as we will adjust it more accurately later on. **The subcarrier board will produce no output after the ceramic filter if the subcarrier frequency is not tuned to the same frequency as the ceramic filter.**
5. **With the audio board connected to a transmitter**, connect a 1v p-p line level signal to the Audio Input connection on the board & adjust the 10kohm Audio level Trimpot until the audio level is correct when monitored on a suitable Satellite receiver. The deviation for AM or FM television is +/- 50KHz, the same as the commercial television stations.
6. The final adjustment of the subcarrier frequency should be done while monitoring the audio quality on a suitable satellite receiver making sure that no distortion occurs. Feed in a suitable music source & adjust the 15uH coil each way until the audio is clean.

OPTIONS:

1. In some cases the subcarrier output impedance may not match some transmitters. A value of 150pF seems to work well with the EME79 Transmitter. Increasing the value over 150pF seems to load the transmitters video causing a washed out picture, reducing the value reduces the subcarrier output level. Anything much lower than 100pF & you may not get enough subcarrier injection.
2. A 2.2Kohm feedback resistor has been used to set the gain of the preamplifier to suit a standard 1vp-p line input which is common with most Camcorders. If you want to use a separate Microphone, the preamplifiers gain can be increased by replacing the 2.2kohm resistor with the 270kohm supplied. Alternatively an Audio mixer can be used to supply line & Microphone level signals of 1volt p-p into the audio board.

NOTES:

1. Check that your audio subcarrier level is high enough with another stations. Common problems are either too much subcarrier that causes patterning (5.5MHz beat) on the picture, or too little causing noise or complete sound dropout on seemingly strong signals. Correct level is when you have a P3 picture with around 20% noise, but still have noise free sound.

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2. By using higher subcarrier frequencies of 6MHz & higher, the common 5.5MHz beat pattern is eliminated on the transmitted picture. This allows the subcarrier level to be increased giving more reliable sound under weak signal conditions. Surplus Satellite receivers are relatively easy to find & can be easily programmed for different audio frequencies.

3. Two Audio / Subcarrier boards on different frequencies can simply be paralleled together for either stereo sound, or for audio & an additional data channel.

4. **What happens to the audio subcarrier when it is used on a transmitter & multiplied up to higher bands ?** As most of us have found already, the video deviation increases by the multiplication along with oscillator phase noise. After much testing & discussions it was found that a 5.5MHz subcarrier still remains but the level of the subcarrier is multiplied. The audio deviation however did not change on the 5.5MHz carrier. Would the original 5.5MHz subcarrier also be found on $5.5\text{MHz} \times 8 = 44\text{MHz}$? Would the 44MHz subcarriers audio deviation have increased from +/-50KHz to +/- 400KHz ? The theory says that this would be found on all multiples of 5.5MHz. The subcarrier increase was found to be a benefit on 10GHz, as the audio subcarrier level was increased by 8x which meant that the audio could be heard with the sometimes fast QSB much earlier than the video picture could be seen. A 6.5MHz subcarrier was used on 10GHz that produced no patterning on the picture. The subcarrier level was set to be the same level as the video carrier unmodulated on a Spectrum Analyzer.

PARTS LIST:

RESISTORS

1 x 100R	1/4 Watt Resistor
1 x 560R	1/4 Watt Resistor
1 x 1k	1/4 Watt Resistor
2 x 2k2	1/4 Watt Resistor
2 x 10k	1/4 Watt Resistor
2 x 100k	1/4 Watt Resistor
1 x 200R	5mm VTL Trimpot
1 x 10k	5mm VTL Trimpot

CAPACITORS

1 x C1	47pF 5.5 / 5.74MHz / 6.0MHz 33pF 6.5MHz (15uH coil)
1 x 150pF	Ceramic Capacitor
4 x 1nF	Ceramic Capacitor
1 x 0.1uF	Monolithic Capacitor
3 x 1uF	25v EXR Electrolytic Capacitor

For Product Support

WEB: www.minikits.com.au

1 x 10uF	25v EXR Electrolytic Capacitor
1 x 47uF	25v EXR Electrolytic Capacitor

INDUCTORS, RF CHOKES, FILTERS

1 x 15uH	TOKO 7KL Coil
1 x SFE5.5MB	Ceramic Filter 5.5MHz
SFE6.0MB	Ceramic Filter 6.0MHz
SFE6.5MB	Ceramic Filter 6.5MHz

SEMICONDUCTORS

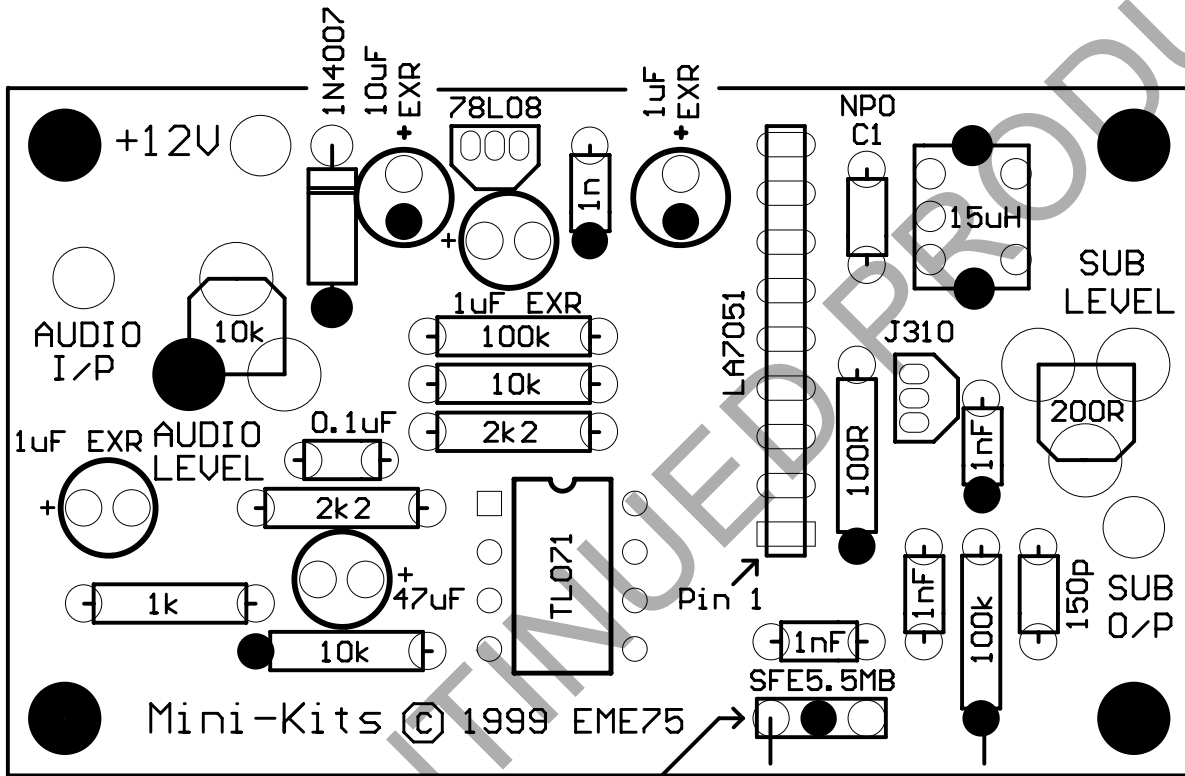
1 x 1N4007	GP Power Diode
1 x 78L08	8v 100mA Regulator
1 x J310	RF J FET
1 x TL071	OP Amp IC (sub LF351)
1 x LA7051	Audio FM Modulator IC

MISCELLANEOUS

1 x PC Board	EME75
1 x Instructions	EME75
3 x 0.9mm PCB Pins	

TOP PC BOARD OVERLAY

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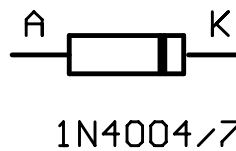
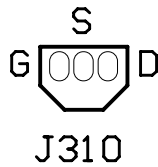
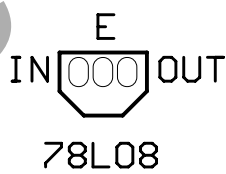
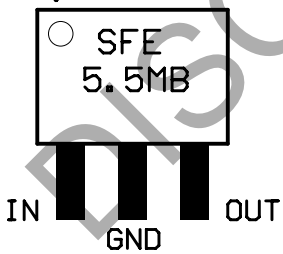


Input



← Add Modification Refer Notes

Colour Dot Input



COMPONENT
PINOUTS
TOP VIEW