PRO3 STEREO CODER

for FM TRANSMITTERS

CONSTRUCTOR GUIDE

Please read fully before construction starts

First, check that the kit contains all the parts listed on the component list. If any parts are missing or damaged, contact us immediately. Next, is your soldering of a reasonable standard and have you got a soldering iron with a tip size of 2.5 mm or smaller. Only proceed if your answer is yes. Remember that you can change the kit for a ready built unit at this stage if you are unsure. (You only pay the price difference).

The **printed circuit board (PCB)** has a **silk screen print** on the topside. You can see **component shapes** and **numbers**. With this, and the component parts list you have all you need to identify components and fit them correctly into the PCB. Take care and time to make sure all components are correctly placed. Finally, make sure that you have the following tools:

Side Cutters: Long Nose Pliers: Screwdrivers: Soldering Iron: Solder: Please note that you get better results using thin 22 SWG solder rather than the thick 18 SWG type.

BUILDING STARTS HERE!

GENERAL: Separate the pages of this manual so you can clearly see this sheet, the component fitting guide, the component list and the large photograph, all at the same time. Fit the smaller components first and work your way through progressively larger components. **Remember this: All components should be pushed down flat to the PCB, (unless stated otherwise).** Use the photograph and the component-fitting guide to help you further.

1. First, fit and solder the **resistors** (R1 – R40). When you have soldered a few components, use your Side Cutters to trim back the excess leads. Resistors can be fitted either way round. Then fit and solder the 4 small 1N4148 orange diodes (D1 – D4), **the correct way round!** They have a black band and this MUST line up with the component shape on the board.
2. Fit and solder **IC1**, **IC2, IC3, and IC4.** These are **integrated circuits** and have either 14 or 16 pins. They **must be fitted the right way with the notch on the device lining up with the shape on the PCB.** Bend the pins slightly with pliers, if needed, to make them fit the holes in the PCB. Make sure all the pins are through the holes in the PCB before you start soldering.
3. At this stage hold the board under bright light and check that you have soldered every component connection so far in the PCB. Also check that connections close to each other aren't bridged with solder. Do the components look to be reasonably flat to the board?
4. Now fit the **variable resistors** VR1, VR2, followed by the **capacitors** C1 – C30. Have a look at the component-fitting guide for help on fitting capacitors to the PCB. **Remember**, fit the parts flat (or very close to) the PCB. Make sure that you fit all the **electrolytic** capacitors the correct way round. Fit the 1N5402 large diode next (D5), with the grey band lining up with the symbol on the printed circuit board.
5. Right, it's time to hold the PCB under the bright light again and check your work carefully for joints you have missed with your iron and also solder splashes.
6. Now fit and solder the rest of the parts, taking a regular glance at the component fitting guide pictures. The two black 3-pin **pre-emphasis jumpers** fit at locations marked J1 and J2. (Next to VR1 and VR2). The 2-pin **stereo/mono** jumper is fitted at position J3. Take care to push the **phono sockets** fully home (with the plastic locator pins going through the PCB), they are a tight fit in the board. **LED1** is the red led and **LED2** is the green one. You must line up the flat section on the devices with that on the PCB silk screen. Make sure that when you solder the red/black power cord to the DC input pads, red wire goes to + and black to -. The two **fuse holder clips** have to be fitted the correct way round or the fuse won't fit. You should fit the **4.864MHz crystal last.** The crystal can fit either way round.
7. Now check the finished PCB by holding it up to the bright light. If you can see light shining through component holes it means you have not soldered that particular component properly, if at all. Check all the electrolytic capacitors are the correct way round and do the same with the integrated circuits. If a soldered component, like an integrated circuit has to be removed, you will need a desoldering pump to do it correctly.
8. Finally, compare your constructed Stereo Coder unit with the one on the large photograph. Are the components on your PCB fitted neatly and flat down to the board surface, like in the photograph.

ABOUT FM STEREO

- As you have already discovered, FM transmitters have only one input socket. Not much good for stereo as it stands. This is where your new **stereo coder** comes in.
- The stereo coder has stereo left and right input phono sockets. The left and right audio signals are processed using a special circuit which "multiplexes" the two signals onto one common output. The single output signal is called the **multiplex output** and this is fed to the transmitter.
- At the listener end, the reciever has a special circuit called a **stereo decoder** built in. This decoder actually decodes the multiplex signal back into separate left and right channels to feed the two speakers.
- If there was no such thing as the stereo coder, we would have to use two transmitters (on different frequencies) and the listeners would need two recievers!

SWITCH ON TIME

1. Set VR1, VR2, and to their mid positions with a small flat blade screwdriver. Remove the jumper from J3 (mono/stereo select) or the output will be mono!
2. Make sure that the PCB underside is not sat directly on a metal surface or you may short-circuit the PCB.
3. Connect the red/black power wire to a regulated power supply. The minimum operating voltage is 11 volts and the maximum is 16 volts. A 13.8-Volt CB type power supply is usually the best choice of power supply. **Make certain** that you connect the red/black power lead the right way with red wire going to positive (+) terminal.
4. Using a single phono lead, make a connection between the **MPX out** socket on the stereo coder, and the input socket on your transmitter. This will make the stereo indicator on your receiver illuminate.
5. Make certain that you disable the pre-emphasis on your FM transmitter (if fitted).
6. Connect audio at line level to the stereo coder input phono sockets (e.g. A CD player). Whilst listening on a good quality FM radio, adjust the sound level (modulation) control on your transmitter for the correct sound level. If you think you need more output (or less) from the stereo coder you can adjust VR1 and VR2. For the listening tests please use a CD that contains music with plenty of separation of musical instruments.
7. The stereo coder has pre-emphasis fitted to make the sound bright and crisp. You can select the European (50 uS) or USA (75uS) standard by fitting the jumper to the inner, or outer pins respectively. However, if you use a **limiter/compressor** in front of the stereo coder (which you should), then please disable the stereo coder pre-emphasis by simply pulling upwards on the pre-emphasis jumpers to remove the link from the pins.
8. In normal use, the jumper J3 will be removed, the green LED2 will be illuminated indicating stereo operation. If you need to revert to mono (for testing or otherwise) then please fit jumper J3. The output will now be in mono and the red led will illuminate.

PROBLEMS?

If the unit does not work when you first switch on, then the first thing to is to carefully re-check your entire construction and component placement. It is unlikely that any parts supplied were faulty to start with, although not unheard of.

1. **No output from the unit at all.** It could be your power supply unit so check this first with a multimeter or try using some other appliance on the power supply unit and see if that works. Check that the red/black power wire is wired to the PCB correctly with the red wire going to positive terminal pin. It is assumed that the transmitter being used is working ok. Faulty phono leads are not uncommon.
2. **Low volume and no stereo light on the reciever.** You probably need to increase the transmitter input level control to cure this problem.
3. **Volume OK, but no stereo.** You have probably left the mono/stereo jumper (J3) fitted to the pins. Simply remove the jumper by pulling upwards.
4. **Tinny sound and possibly very wide stereo with distortion.** You have not disabled the pre-emphasis on your transmitter. Or you are using a limiter/compressor in front of the coder and have not disabled the pre-emphasis on the stereo coder unit.
5. **Unstable Performance.** Too many components stood up on long legs above the PCB. Dry soldered joints or missed completely.
6. **Not much (or no) separation.** Assuming that the music definitely does have good separation to start with, this problem usually shows up only if you are using a very low quality transmitter that has a poor audio response.
7. **Music only comes out of one side.** Either the stereo phono lead to the stereo coder input is faulty or VR1 (or VR2) is turned right down.

COMMON CONSTRUCTOR ERRORS

1. ICs fitted wrong way round or wrong location
2. IC pins bridged with solder
3. Joints not soldered at all
4. Very poor soldering quality
5. Solder splashes
6. Components stood up on long leads.
7. Build Instructions not followed closely.

You can check the soldered joints better with a magnifying glass and also find shorted tracks. A multimeter is also very handy at locating shorted or broken tracks.

This is a complex circuit so if it is not working correctly after you have built it, please do not panic. Give us a call for advice on what to do next.

Believe it or not, some people do not bother to even read the instructions that are provided to help build the kit. Of course, YOU followed the instructions to the letter, didn't you?

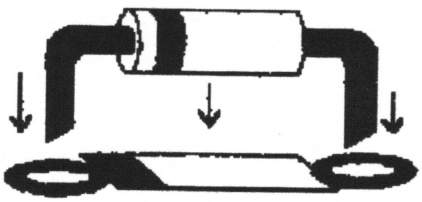
COMPONENT LIST FOR STEREO CODER PRO 3

R1	47R	yellow purple black gold	C1	100pF	101J	IC1	TLO74	TLO74CN
R2	47R	yellow purple black gold	C2	100pF	101J	IC2	4016	4016BE
R3	47K	yellow purple orange gold	C3	10uF	10uF 16V	IC3	4013	4013BE
R4	4K7	yellow purple red gold	C4	10uF	10uF 16V	IC4	4060	4060B
R5	4K7	yellow purple red gold	C5	1500pF	152K	VR1	10K	Variable Resistor
R6	4K7	yellow purple red gold	C6	1nF	102	VR2	10K	Variable Resistor
R7	4K7	yellow purple red gold	C7	1nF	102	FB1	5T	Ferrite Bead
R8	47K	yellow purple orange gold	C8	1500pF	152K	FB2	5T	Ferrite Bead
R9	1M	brown black green gold	C9	68pF	68J	J1	3 Pin	Jumper EQ 50us
R10	1M	brown black green gold	C10	68pF	68J	J2	3 Pin	Jumper EQ 50us
R11	100K	brown black yellow gold	C11	220uF	220uF 16V	J3	2 Pin	Jumper
R12	100K	brown black yellow gold	C12	68pF	68J	Led 1	Red	
R13	100R	brown black brown gold	C13	100pF	101J	Led 2	Green	
R14	560R	green blue brown gold	C14	1nF	102	XTAL	4.864MHz	Crystal AEL
R15	27K	red purple orange gold	C15	1nF	102	Fuse	1A +	2 Fuse Clips
R16	4K7	yellow purple red gold	C16	100nF	u1K63 or100nK63	3 x	Phono	
R17	0R	single black band	C17	220pF	221J	1 x	PCB	Board
R18	27K	red purple orange gold	C18	220pF	221J	1mm	Wire	Red / Black
R19	0R	single black band	C19	1.8nF	182			
R20	4K7	yellow purple red gold	C20	1.8nF	182			
R21	100R	brown black brown gold	C21	1.8nF	182			
R22	47K	yellow purple orange gold	C22	100pF	101J			
R23	4K7	yellow purple red gold	C23	33pF	33J			
R24	4K7	yellow purple red gold	C24	100nF	u1K63 or100nK63			
R25	27K	red purple orange gold	C25	2.2uF	2.2uF 63V			
R26	4K7	yellow purple red gold	C26	2.2uF	2.2uF 63V			
R27	4K7	yellow purple red gold	C27	220uF	220uF 16V			
R28	4K7	yellow purple red gold	C28	1nF	102			
R29	4K7	yellow purple red gold	C29	47uF	47uF 16V			
R30	100K	brown black yellow gold	C30	100pF	101J			
R31	47K	yellow purple orange gold						
R32	47K	yellow purple orange gold						
R33	100R	brown black brown gold	D1	4148	1N4148 Diode			
R34	1K0	brown black red gold	D2	4148	1N4148 Diode			
R35	560R	green blue brown gold	D3	4148	1N4148 Diode			
R36	0R	single black band	D4	4148	1N4148 Diode			
R37	47K	yellow purple orange gold	D5	5402	1N5402 Diode			
R38	47K	yellow purple orange gold						
R39	0R	single black band						
R40	100K	brown black yellow gold						

COMPONENT FITTING GUIDE

1 ZENER DIODES

MUST BE FITTED THIS WAY IN PCB



PUSH FLAT TO PCB

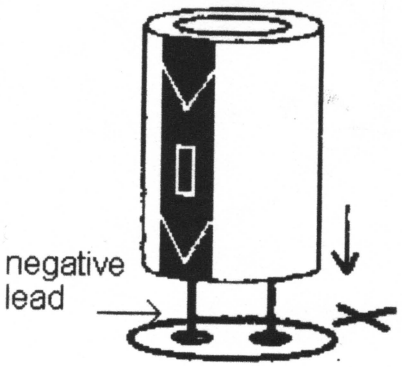
2 CAPACITORS

these are fitted flat to the pcb
but can fit either way in the PCB holes

ceramic disc capacitor

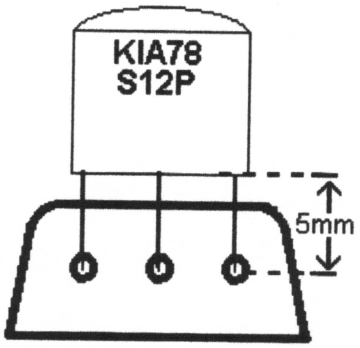
3 ELECTROLYTIC CAPACITORS

FIT IN PCB LIKE THIS AND MUST BE PUSHED DOWN FLAT TO PCB.



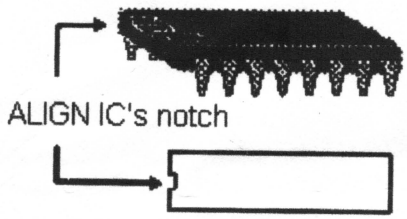
4 SMALL IC's

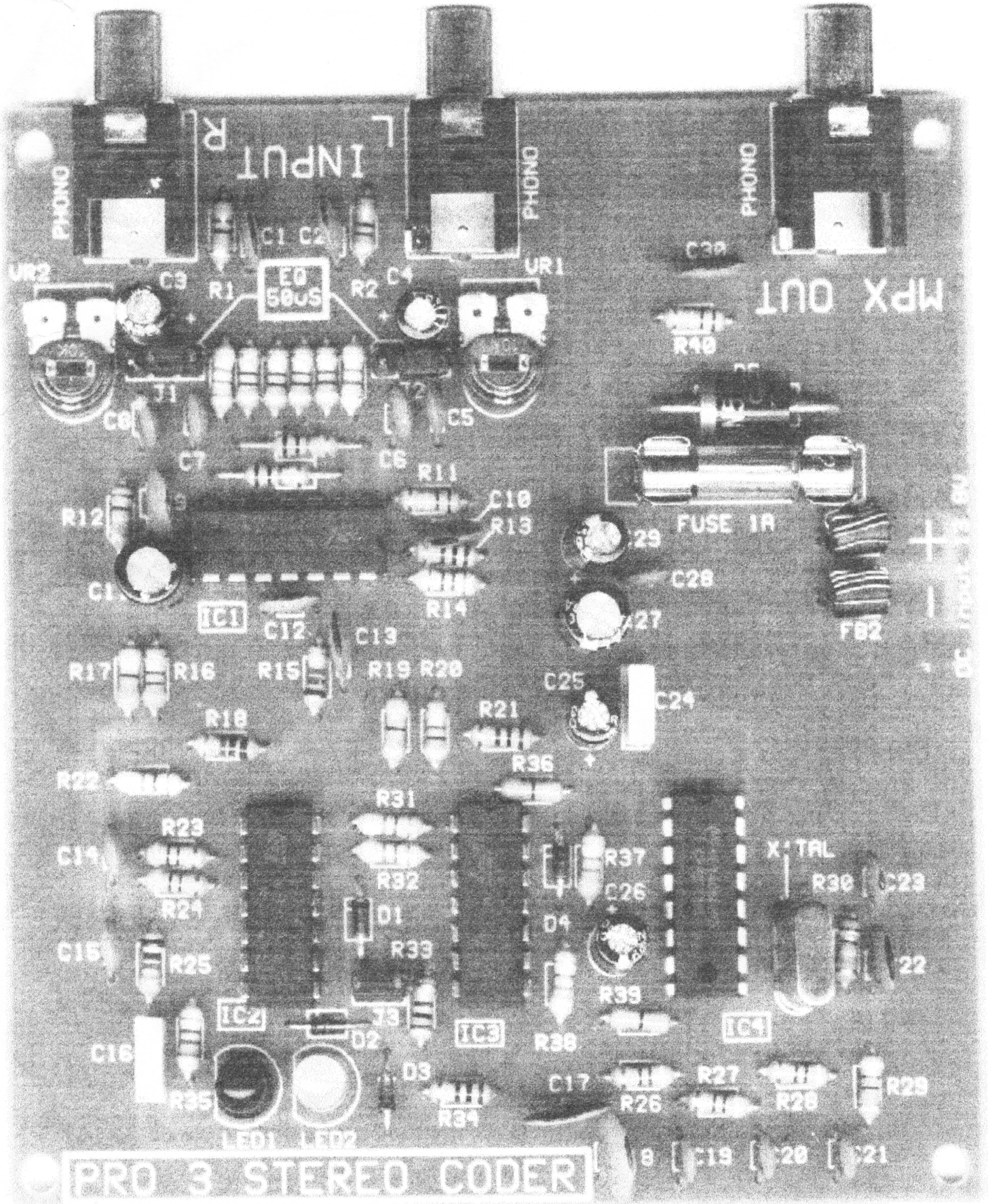
MUST BE FITTED THE CORRECT WAY ROUND IN THE PCB.
THE TRANSISTOR BODY SHOULD BE WITHIN 5mm OF THE PCB



INTEGRATED CIRCUITS

MUST BE FITTED CORRECT WAY ROUND




INPUT
L
R
PHONO
PHONO
PHONO
MPX OUT
EQ
50uS
VR1
VR2
J1
J2
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
R1
R2
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
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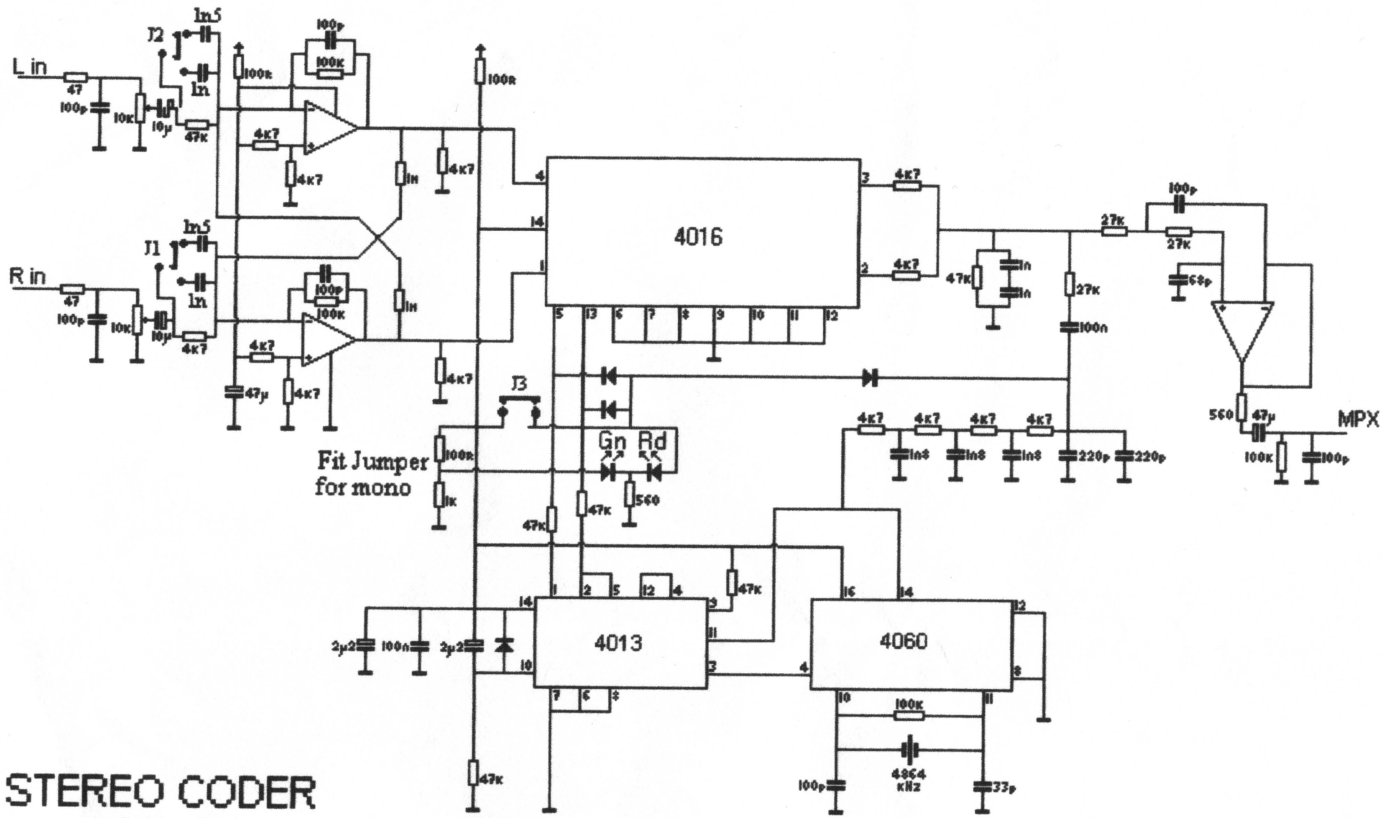
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
D1
D2
D3
D4
IC1
IC2
IC3
IC4
FUSE 1A
FB2
X'TAL
LED1
LED2
PRO 3 STEREO CODER



STEREO CODER
Mk 3