

Pt.2: By JOHN CLARKE
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Low-Noise Stereo Preamp With Motorised Volume Control & Input Selector

In Pt.2 this month, we describe the assembly of the Input Selector module and its companion Switch Board. We also show you how to make the IDC cables that link the modules together and give the remote control set-up and test procedure.

THE 3-INPUT SELECTOR board (Fig.13) is straightforward to assemble. Install the resistors and diodes D1-D3 first, then install the ferrite beads, the IC socket and the MKT capacitors (do not use ceramic capacitors on this board).

Once these parts are in, install the four transistors, noting that Q5-Q7 are BC327s while Q8 is a BC337. The two electrolytics can then go in, followed by the 10-way and 14-way header sockets. **The header sockets must be**

installed with their slotted key-ways towards the top.

Finally, complete the assembly by installing the relays, the three stereo RCA input sockets and the two vertical RCA output sockets. Note the left and right labelling for the output sockets – this is not a mistake and arranging them this way gives the optimum layout for the PCB.

Switch board assembly

There just four parts on the switch

board – the three pushbutton switches on one side and the 14-way IDC header socket on the other (see Fig.14).

The three pushbuttons can go on first but note that they must be installed the right way around. These have “kinked” pins at each corner plus two straight pins for the integral blue LED. The anode pin is the longer of the two and this must go in the hole marked “A” on the PCB.

Once the pins are in, push the buttons all the way down so that they sit

flush against the PCB before soldering their leads. The IDC header socket can then be installed on the other side of the board, with its key-way notch towards the bottom.

Initial checks

Before installing the three ICs on the preamp board, it's a good idea to check the supply voltages. If you haven't built the power supply yet, you can either use a suitable dual-rail bench supply or skip until the final assembly in the chassis.

Assuming you do have a power supply, connect the +15V, -15V & 0V leads to CON6 and switch on. Now check the voltages on pins 8 & 4 of the two 8-pin IC sockets; ie. between each of these pins and the 0V (centre) terminal of CON6. You should get readings of +15V and -15V respectively.

Similarly, check the voltage on pin 14 of IC3's socket. It should be between +4.8V and +5.2V.

If these voltages are correct, switch off and install the ICs. Note that IC1 & IC2 face one way while microcontroller IC3 faces the other way.

Making the test cables

Before testing the unit, it will be necessary to make up two IDC cables. Fig.15 shows how these cables are made. Pin 1 on the header sockets is indicated by a small triangle in the plastic moulding and the red stripe of

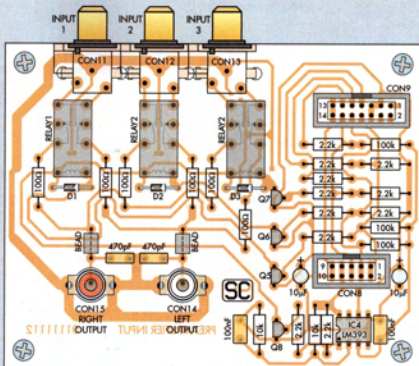
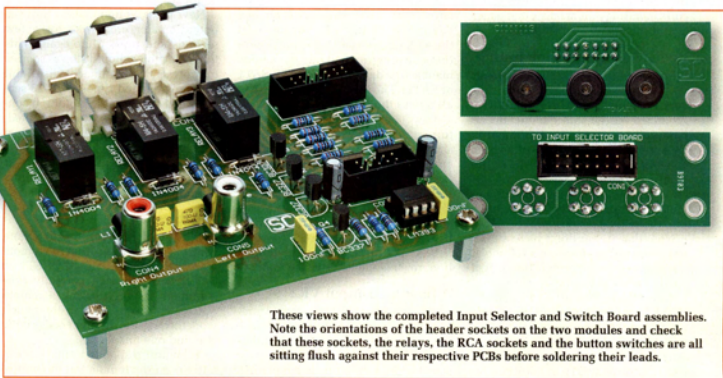
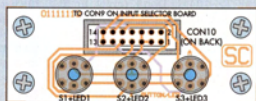
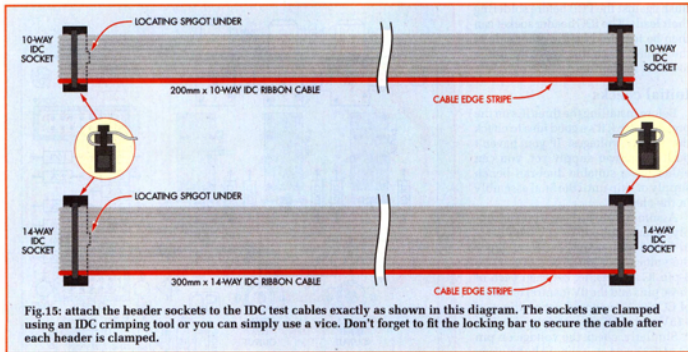


Fig.13 (above): follow this diagram to build the Input Selector PCB. Make sure that the two header sockets are correctly orientated and note that Q5-Q7 are BC327 PNP transistors while Q8 is a BC337 NPN transistor.

Fig.14: the three switches are mounted on the front of the Switch Board while the header socket goes on the back (key-way towards S2). Take care with the switch orientation (see text).



These views show the completed Input Selector and Switch Board assemblies. Note the orientations of the header sockets on the two modules and check that these sockets, the relays, the RCA sockets and the button switches are all sitting flush against their respective PCBs before soldering their leads.



the cable must always go to these pins.

You can either crimp the IDC headers to the cable in a vice or use an IDC crimping tool (eg. Altronics T1540 or Jaycar TH-1941). Don't forget to fit the locking bars to the headers after crimping, to secure the cable in place.

Having completed the cables, it's a good idea to check that they have been correctly terminated. The best way to do this is to plug them into the matching sockets on the PCB assemblies and then check for continuity between the corresponding pins at either end using a multimeter.

Remote control/switch testing

The remote control functions can now be tested using a suitable universal remote, eg. Altronics A1012. As stated earlier, the default device mode programmed into the micro is TV but if this conflicts with other gear you can choose SAT1 or SAT2 as the device instead.

Whichever mode is chosen, you must also program the correct code into the remote (see panel).

Note that if you don't have a dual power supply, you can still check the remote control circuit by using a single-rail 9-15V supply connected between the +15V and 0V terminals of CON6 (watch the polarity). As before, check the voltage on pin 14 of IC3's socket (it must be between +4.8V and +5.2V), then switch off and install IC3 (pin 1 towards IRD1). In addition, in-

sert the jumper link for LK3 to enable the mute return function.

That done, rotate VR2 fully anticlockwise and use the remote to check the various functions. First, check that the inputs can be selected using the 1, 2 & 3 buttons on the remote and the S1-S3 buttons on the Switch Board. Each time a button is pressed, you should hear a "click" as its relay switches on and the blue LED in the corresponding switch button should light.

In addition, the orange Acknowledge (Ack) LED should flash each time you press a button on the remote. **If the ACK LED doesn't flash, make sure the code programmed into the remote matches the device mode (ie, TV, SAT1 or SAT2). The ACK LED won't flash at all unless the code is correct.**

Now check that the volume pot turns clockwise when the Volume Up and Channel Up buttons are pressed and anti-clockwise when Volume Down and Channel Down are pressed. It should travel fairly quickly when Volume Up/Down buttons are pressed and at a slower rate when the Channel Up/Down buttons are used.

If the pot turns in the wrong direction, reverse the leads to the motor.

Adjusting trimpot VR2

Next, set the volume control to mid-position and hit the Mute button. The pot will rotate anti-clockwise and as soon as it hits the stops, the clutch will start to slip. While this is happening,

Motorised Volume Pot.

Altronics has advised that they can supply a dual-gang 5kΩ log motorised pot (Cat.R1998) for the preamplifier. This should be used in preference to a 20kΩ pot and the 4.7kΩ shunt resistors omitted.

slowly adjust VR2 clockwise until the motor stops.

Now press Volume Up to turn the potentiometer clockwise for a few seconds and press Mute again. This time, the motor should stop as soon as the pot reaches its anticlockwise limit.

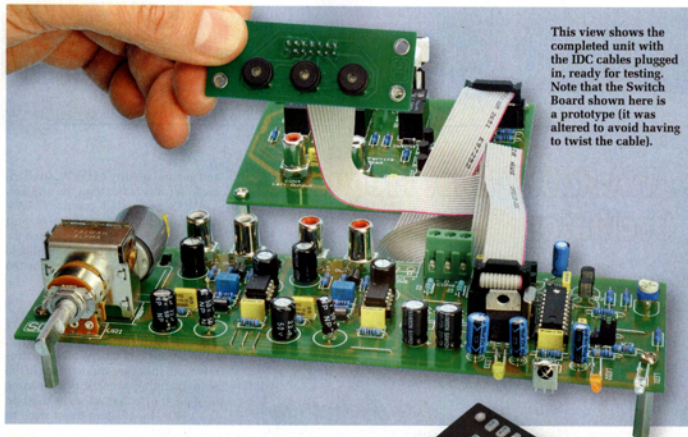
A programmed time-out of 13-seconds will also stop the motor if it continues to run after Mute is activated. This means that you have to adjust VR2 within this 13s period.

If the motor stops prematurely or runs for the full 13s after the limit is reached, try redoing the adjustment.

Troubleshooting

If the unit fails to respond to remote control signals, check that the remote is in the correct mode (TV, SAT1 or SAT2) and has been correctly programmed. If you're using a remote other than those listed in the panel, work through the different codes until you find one that works.

If the unit responds to the 1, 2 & 3 buttons on the remote but the button



This view shows the completed unit with the IDC cables plugged in, ready for testing. Note that the Switch Board shown here is a prototype (it was altered to avoid having to twist the cable).

Selecting The Mode & Programming The Remote

As stated in the text, it's necessary to program the universal remote control correctly. By default, the microcontroller's RC5 code is set to TV but SAT1 or SAT2 can also be selected. Just press and hold button S1 on the Switch Board during power-up for SAT1 or button S2 for SAT2. Pressing S3 at power-up reverts to TV mode.

Once you've chosen the mode or "device", the correct code must be programmed into the remote. This involves selecting TV, SAT1 or SAT2 on the remote (to agree with the microcontroller set-up) and then programming in a three or 4-digit number for a Philips device. That's because most Philips devices (but not all) rely on the RC5 code standard. Most universal remote controls can

be used, including the Altronics A1012 (\$19.95) and the Jaycar AR1726 (\$37.95). For the Altronics A1012, use a code of 023 or 089 for TV mode, 242 for SAT1 or 035 for SAT2.

Similarly, for the Jaycar AR1726, use 103 for TV, 1317 for SAT1 or 1316 for SAT2.

In the case of other universal remotes, it's just a matter of testing the various codes until you find one that works. There are usually no more than 15 codes (and usually a lot less) listed for each Philips device, so it shouldn't take long to find the correct one.

Note that some codes may only partially work, eg, they might control the volume but not the input selection. In that case, try a different code. In ad-

The unit will work with most universal remotes including the Altronics A1012.

dition, some remotes may only work in one mode (eg, TV but not SAT).

For example, if you have a Digitor 4-in-1 remote, you can use 5005 for TV1 or TV2 but there's no suitable code for SAT. Similarly, if you have a AIFA RA7, you can use 026 for TV1 or TV2 but again there's no suitable code for SAT that works.

switches don't work, check the IDC cable from the Switch Board. Similarly, if the remote volume function works but not the remote input selection, check the IDC cable from the preamplifier.

Note that the cable from the preamplifier also supplies power to the Input Selector board. Check that there is 5V between pins 8 & 4 of IC4 on the

Selector Board and again check the IDC cable if this supply rail is missing.

Audio testing

If you have a $\pm 15V$ supply, you can test the preamplifier by connecting its outputs to a stereo amplifier and feeding in audio signals from a CD player.

However, note that the left and right channel audio grounds are not con-

nected to the 0V rail at CON6 on the preamplifier PCB. That's necessary to avoid a hum loop, since the two audio channels are normally earthed back through the power amplifiers via the signal leads. This means that, to test the unit, you must temporarily connect the audio grounds at CON1 & CON3 to the power supply 0V rail (eg, the tab of REG1) using clip leads. **SC**