The interesting point is that the 40 positions on the channel switch can be placed at any point between the count of 1 and 511, this giving a frequency coverage of over 5MHz with a 10kHz channelling or 2.5MHz+ with 5kHz channelling. The important feature to recognise is that the code lines from the switch should not over-range the available program range. In other words the use of six program lines will only permit a count range between 63 and 0 so if the switch gives out 136

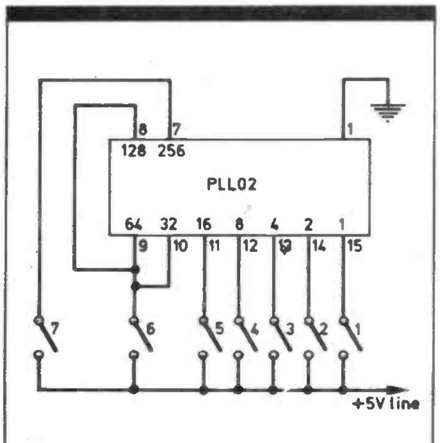

Fig. 10.

— 174, the range must include eight input lines. A simple device could be shown as in **Fig.10.**

By closing switch 6 we have a pre-loaded count of 224 already in the line, using switches 1 — 5 gives us a count range of 31, so we have now an effective range of 224 — 255. By closing switch 7 and opening all the other switches we now have 256 count. By progressing through switches 1 — 5 gain with 7 closed we can now count to 287 so that in effect using the above technique we have a count range of 224 — 287, so 64 positions are open to us in this instance from the combinations of switches 1 — 7, and the 64 positions can be seen anywhere up to 511, ie. the 640kHz swing can be at any point in a 5MHz range. As can be seen we have pre-loaded 224 so that it becomes obvious that by pre-loading any quantity up to 256 we can set our operating range to suit, but in order to cover certain areas we may have to arrange an intermediate switching of the loaded point.

The practical operations involved are relatively simple and by using EPROMs to carry out the mechanical operation just described the techniques are well within the skill of the average amateur. The main problem is in the programming of the EPROMs. The important feature is to establish the program already being fed to the EPROM by preparing a truth table on the pattern shown for the MC145106. It is only necessary to check the code at channel 1 and channel 40, the rest can be calculated. The technique for establishing the code pattern is to check the voltage level on each of the program lines in turn at the selected channel switch position. A voltage of some five volts indicates a logic 1, and any voltage less than 0.5 indicated logic zero. It is advisable in these cases to use an analogue meter of some 20,000 ohms per volt to present a suitable load otherwise random static voltages may affect the readings.

In discussing the practical operation probably the most suitable manner would be to use one of the most common circuits. The one chosen is used by a variety of manufacturers and is given in **Fig.11.** The VCO control voltage is derived from pin 17 and goes via R201, C203 and R204 to the varicap diode D201 which is across the coil L203. C304 serves as the DC isolating cap and has a loading effect on frequency range, so being in series with the varicap controls the VCO operating range. The KC7310 device acts as the transmit mixer and VCO. The VCO output is tapped off at pin 2 of the 7310 and fed via C305 to the PLL, in this case a 7131. The VCO return via C305 is red to pin 19 of the PLL and in the PLL is fed to the programmable divider. This is controlled by an internal ROM and this ROM accepts the input lines from the channel switch (pins 1 — 6 incl.).

The T/R line instructs the internal ROM to read the offset and consequently moves the VCO frequency, as discussed previously. A certain amount of the RF is fed back to the PLL via pin 14 as a lock check and an out-of-lock indication causes the device to inhibit, this preventing any off-frequency transmission.

The channel switch controls the digital information to the device and at the same time this information is fed to the digital display.

The techniques required to override the synthesiser shown and to vary the output frequency to a previously determined range are all accomplished on one board. (**Fig.4**) This board accepts the incoming information and takes over control of the VCO in the following manner.

The program information is fed to the EPROM and this transforms it to an acceptable code for the PLL used. The control functions are taken over as per the layout shown for the device and the actual circuit used is shown in **Fig.4.**

The physical operations involved are to lift the end of R201 adjacent to TP1 and clear it from the board. Run a wire from Pin 7 on the new board (shown as output on diagram) to this resistor. The 10.240 crystal is removed and soldered on to the new board together with the 56pF capacitor. The other capacitor is replaced on the new board by a 33pF cap. The program lines are removed from pins 1 — 6 on the old board and inserted in pins 8 — 3 on the new board. A T/R line point is taken from the junction of R316 and diode MA150 (D209) and fed to pin 2 on the new board. The 12V point is fed from the set side of the on/off switch and a suitable earth connection made. The VCO return is taken from pin 2 of the 7310 mixer by first removing C305 and taking the wire from the 7310 side to the new board. The inhibit line is disabled by cutting the track at pin 14 on the 7130.

By connecting a voltmeter between pin 8 of the new board and earth the conversion should be complete. Initially set the channel switch to channel 20, then adjust the VCO coil until a voltage of some 5V appears at pin 8. This voltage should stay at 5 volts when the channel switch is moved from 1 — 40. This indicates that the circuit is in lock throughout the new frequency range. In the case of difficulty the check points are as follows:-

a) Check on pins 2 & 3 of the 145106 to ensure that the 10.240 oscilator is working.
b) Check pin 5 for 5.12MHz output.
c) Check at mixer transistor for 15.36MHz, if not present adjust tripler coil to give a maximum of 15.36MHz output (core flush with top of can).
d) Ensure that EPROM is receiving 5 volts and no more.
e) Check that T/R line is switching.
f) Ensure that VCO return is present.

The actual RF voltages as shown on a scope should be in excess of 0.6 volts in case of the RF return from