# Storno 5000 Conversion

*Graham Biggs G0OSF converts the Storno CQM 5662S synthesised ex-PMR transceiver to 70cm*


First of all you will require two series resonant crystals to Storno specification 98-0157. The first is 47.70000MHz and the second 45.32223MHz.

Referring to Fig.1, unscrew the top cover and remove the small PROM board (do not discard this board) then disconnect and remove all boards except the synthesizer. Remove all wiring to the synthesizer board.

Remove the RF screen (metal casing) from the synthesizer card and unscrew and carefully remove the synthesizer board. Refer to Fig.2 and check the transistor - if it is in fact a FET then you can skip the next paragraph after removing the RF screen, if it is a transistor then follow these instructions.

Carefully unsolder R1 and replace with a 39k 5% 0.125W resistor. Unsolder R2 and replace with a 4k7 5% 0.125W resistor. Add wire links and 560R 5% 0.125W resistor as shown in Fig.2. If you want a visual indication that the power is on and the 8.5V supply is working, then refer to Fig.2 and unless already fitted, connect the components and LED as shown (the LED is soldered directly to the board holes). This will act as an on/off indication and will only light when the 8.5V stabilised supply is available. Replace the synthesizer card without the screening can, ensuring that all the screws (except those from the screening can) are replaced and tight, as some of these are used as earthing points, without which the synthesizer will not work.

Remove the transmit crystal and replace with the 47.7MHz crystal. Replace the receive crystal with the 45.32223MHz one (Fig.3). Connect the PTT switch and the 12V supply by soldering to the rear connector pins (Fig.4). By not connecting the PA supply at this stage prevents any damage and removes the need for a dummy load at the moment.

Switch the set on at the front panel. Using a counter with a simple coupling loop placed over the receive crystal oscillator (Fig.3), adjust L2 until the frequency is 45.32223MHz or as near as possible. Using a millivoltmeter or scope and diode probe connected to TP1, adjust L7 for maximum DC reading. Place coupling loop over C2, adjust C2 until the frequency reads 137.03MHz. Using a voltmeter, measure the voltage on TP6. When the synthesizer is 'in lock' this voltage should be between 7.8 and 8.2V. Switch the set off. Take the PROM card removed earlier and remove the PROM from its socket. Carefully place the card onto its original connectors. Don't force it all the way down because there is no screening can - just make sure the connectors make contact. The receiver VCO should now be set to 138.09583MHz corresponding to a final receive frequency of 435.6875MHz which is the upper limit. Check that TP6 still indicates 'in lock'. If not adjust C2 until the synthesizer locks and then go back to check, with PROM board removed, that the synthesizer is still locked. Once this is achieved the transmit VCO is now configured.

Using a counter with a simple coupling loop placed over the transmit crystal oscillator, adjust L1 until the frequency is 47.7MHz, or as near as possible with the PTT pressed. Using an RF millivoltmeter or diode probe connected to TP1, adjust L4 for maximum DC reading. Place coupling loop over C1 and,

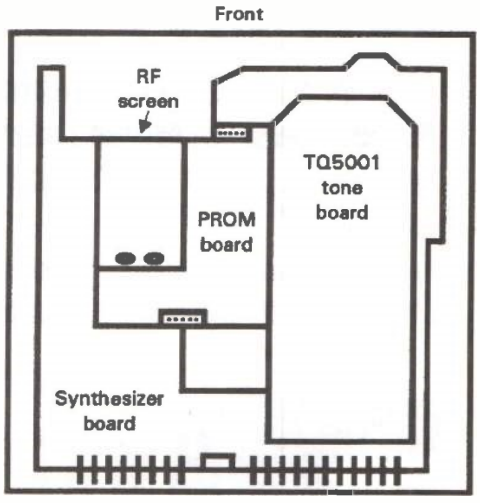
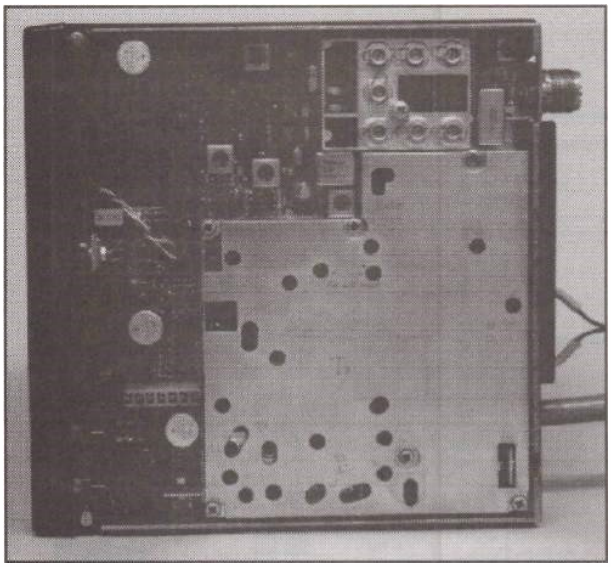



**Fig. 1 Board location (top)**



with PTT pressed, adjust C1 until the frequency reads 144.16667MHz.

Using a voltmeter, measure the voltage on TP6 with the PTT pressed. When the synthesizer is 'in lock' this voltage should be between 7.8 and 8.2V. Switch the set off. Again, take the PROM card removed earlier and remove the PROM from its socket. Carefully again place the card onto its original connectors, making sure you again don't force it all the way down because there is no screening can - just make sure the connectors make contact.

The transmit VCO should now be set to 145.22917MHz, with PTT pressed, corresponding to a final transmit frequency of 435.6875MHz which is the upper limit. Check that TP6 still indicates 'in lock'. If not, adjust C2 until synthesizer locks and then go back to check with PROM board removed that the synthesizer is still locked, making sure you press the PTT each time the check is made. Once this is achieved the transmit VCO is configured.

Switch the set off. Refit the synthesizer screening can. Re-check both the crystal oscillators and adjust as above if necessary. The synthesizer is now configured. Switch the set off.

Unscrew the bottom cover to expose the transceiver board and RF screen. Carefully remove the RF screen by unscrewing the six screws and inverting the set. Refer to Fig.5, if the extra board is fitted then proceed, if not then go to the paragraph 'Transmitter alignment'.

Remove all the other screws from this board including the two small gold coloured ones from either side of the RF output transistor (see Fig.6) - keep these screws separate as they are a different size to all the others. Turn the set over and gently unscrew the hexagonal locknut from the underside of the smaller output driver transistor. Now carefully remove the transceiver board. There is a small board shown in Fig.5 which must be unsoldered.

Once this is done a 6k8 5% 0.125W resistor must be soldered into the place shown on Fig.5 as R10. Similarly a 4k7 5% 0.125W resistor must be soldered into the place shown in Fig.5 as R11. Solder a 1N4148 silicon diode into the place marked as D1 on the diagram.

Refit the transceiver board ensuring that the heatsink compound on the power transistor and its driver has not been wiped off and screw down. Don't forget the locknut on the driver transistor (do not overtighten).

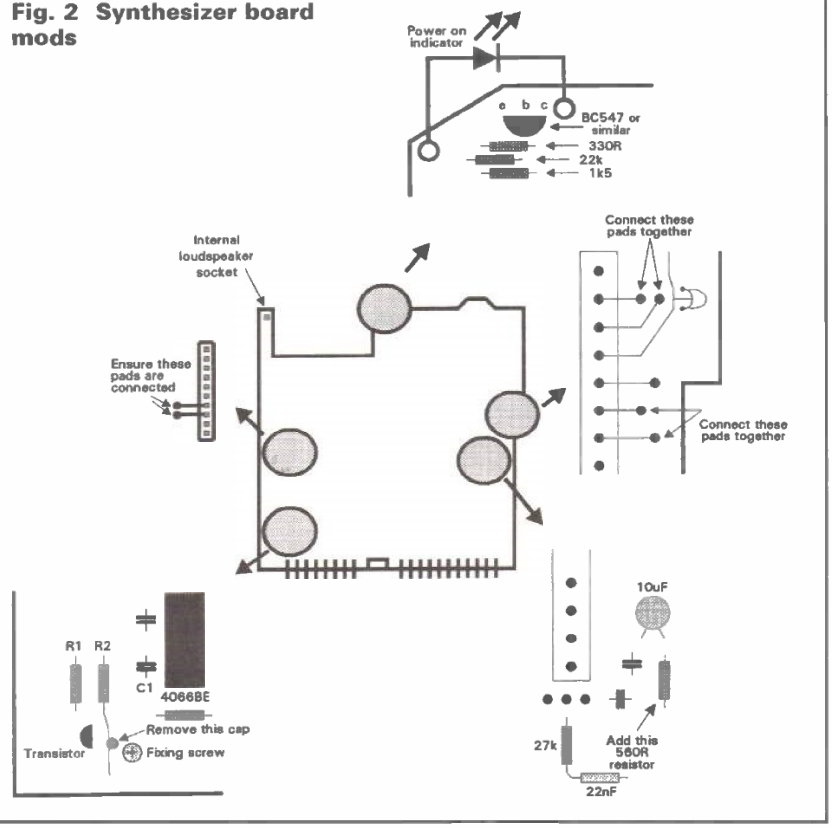
## Transmitter alignment

Now the transmitter board is ready for setting up. Refer to Fig.6. Switch the set on. When the PTT switch is pressed the red 'TX on' LED should light. Place a diode probe on TP1 and adjust L1 for maximum reading when PTT is pressed. Move the diode probe to TP2 and adjust L2 and L3 for maximum reading when PTT is pressed.

Place the diode probe on TP3 and adjust C1 and C2 for maximum reading with PTT pressed (you may not need to move these much). Switch the set and supply off. Add the +12V link on the rear connector to the PA supply (Fig. 4). Connect a dummy load capable of at least 20W to the RF socket. Switch the supply and set back on. Place a diode probe onto TP4 and adjust C3 and C4 for maximum reading when PTT is pressed.

The transmitter is now tuned

**Fig. 2 Synthesizer board mods**



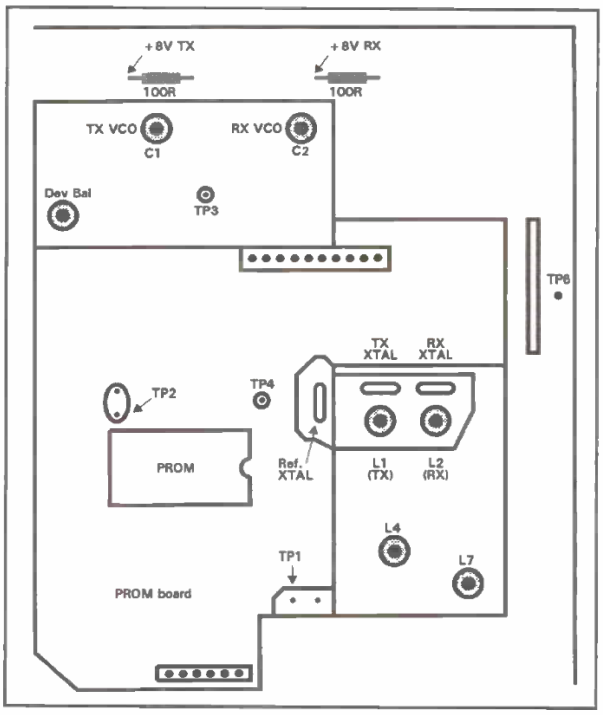



**Fig. 3 Synthesizer board test points**

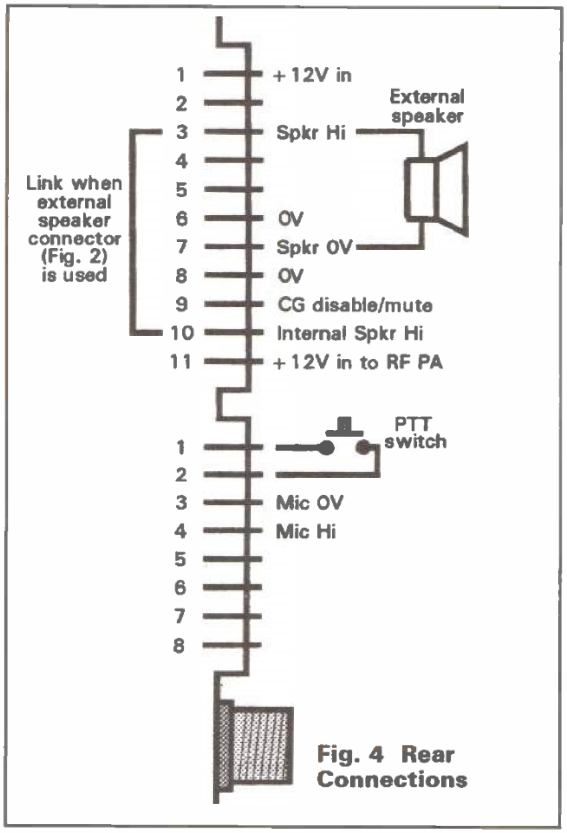



**Fig. 4 Rear Connections**

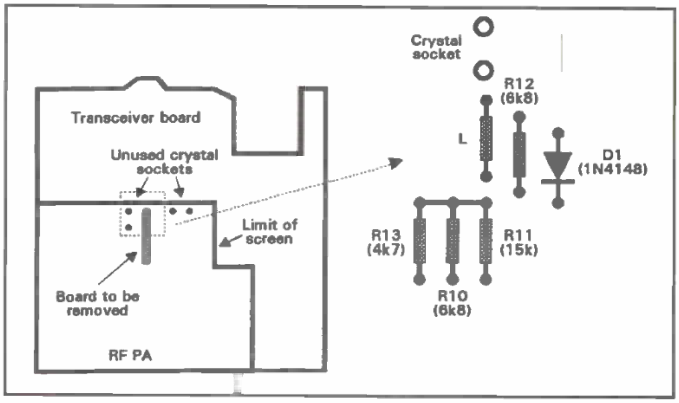



**Fig. 5 Transceiver board mods**

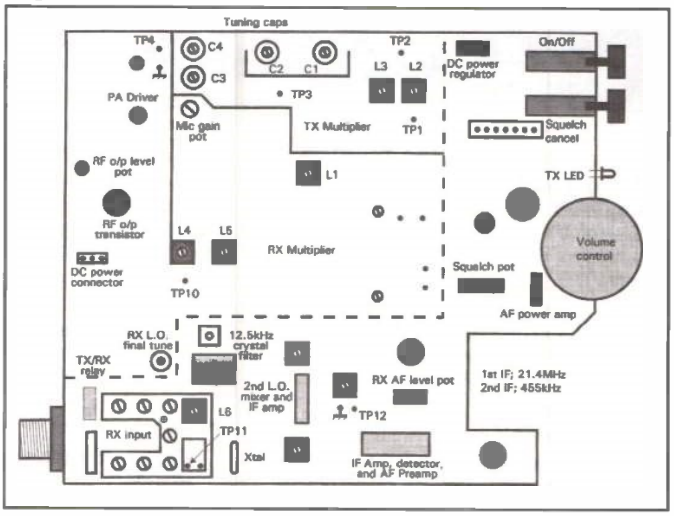



**Fig. 6 Transceiver board layout**

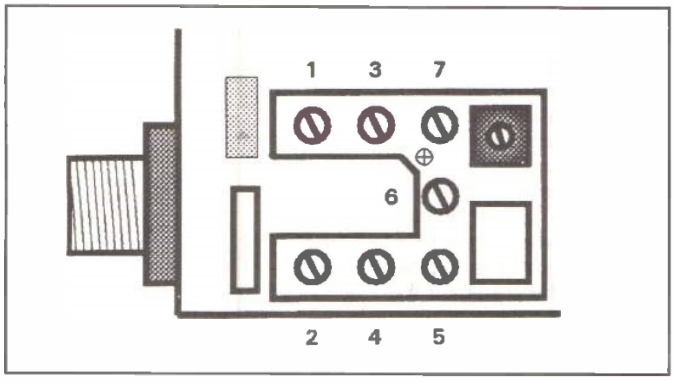



**Fig. 7 Receiver tuning points**

since the PA is wideband and will draw some 5 to 6A when transmitting on full power. The power output can now be set if required using an appropriate power meter and the control shown in Fig.6 (full clockwise is maximum).

## Receiver alignment

With the set still switched on, place a diode probe onto TP10 and adjust L4, L5 and receive local oscillator final tuning capacitor (Fig.6) for a maximum reading. If you place a coupling loop over this tuning capacitor and connect to a frequency meter, the frequency here will be 21.4MHz lower than the frequency that the set is tuned to. Switch the set off and replace the RF screen. Refer to Fig.4 and, if no speaker already fitted, either connect a 4 or 8 ohm speaker to the rear connector as shown for an

external speaker, or put the link in for an internal speaker and connect it to the connector as shown in Fig.2.

Switch the set back on. Connect a signal generator, or use transmissions from another set close by, with the frequency set to 432.5MHz. Refer to Fig.7. With the 'squelch cancel' switch pressed, adjust the points 1 to 7 in turn to reduce the hissing noise in the speaker. As the hissing noise is reduced and the tone increases in volume, begin to reduce the input signal level so that the hiss comes back up and then go back to the adjustment. Keep going back until you are confident that it is tuned to the best of your ability.

The set is now converted and the bottom cover can be replaced. If it is purely for packet, then the packet output can be connected to the mic connections shown in Fig.4 and the LS output from the set can be connected to your TNC or whatever. Refer to the channel programming table for programming.

For voice communication then a small mic amp as shown in Fig.8 should be employed. Also the crystal filter (Fig.6) may be a little narrow and clip the signal. If this is the case then it would need replacing with a 25kHz type. Deviation level can be adjusted using the mic gain pot (Fig.6).

An EPROM board for multi-channel operation for these and the 2 metre 5114S models is planned for next month's issue, space permitting.

*Queries regarding this conversion must be addressed to the author, enclosing a stamped self-addressed envelope if a reply is required. Write to; Graham Biggs G0OSF, 16 Maple Drive, Newport, Isle of Wight PO30 5QP. Any reported corrections to this feature over the next 12 months will be given on the Ham Radio Today 24hr info line, Tel. 01703 263429.*

***Please do not*** contact the magazine staff or the publishers (Nexus) for sources of specific ex-PMR equipment, as they cannot help. Check your local rallies and Ham Radio Today advertisements for this. If you have a copy of the *'2-Way Radio Conversion Handbook'* published by Argus Books *(available from Ham Radio Today advertisers Poole Logic, Tel. 01202 683093)*, this also contains a list of ex-PMR dealers and suppliers.

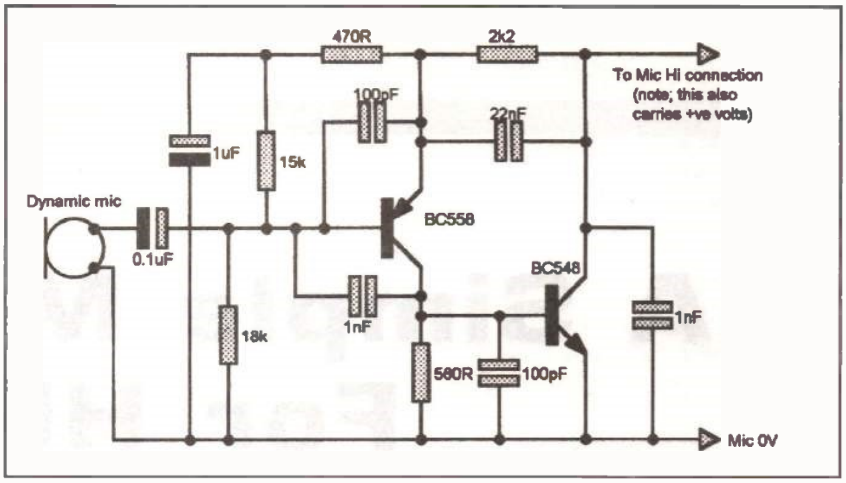



**Fig. 8 Mic amp**

## Frequency programming

*If the old PROM card is plugged back in with the PROM removed, then to obtain the frequency required, look it up on this table and then simply connect the PROM pins marked '0' to 0V. You can pick 0V on PROM pins 8 and 15.*

| | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|---|---|---|---|---|---|---|---|---|
| **PROM pin No's** | 9 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| **Freq (MHz)** | | | | | | | | |
| 432.500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 432.600 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 432.625 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 432.650 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 432.675 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 432.700 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 433.000 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 433.025 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 433.050 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 433.075 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 433.100 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 433.125 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 433.150 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 433.175 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| 433.200 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 433.225 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 |
| 433.250 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 433.275 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| 433.300 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 433.325 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 433.350 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 433.375 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 433.400 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 433.425 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 433.450 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 433.475 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 433.500 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 433.525 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 433.550 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 433.600 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| 433.625 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 433.650 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 433.675 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |
| 433.700 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 433.725 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 433.750 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| 433.775 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 434.600 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 434.625 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 434.650 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 434.675 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 434.700 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 434.725 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 434.750 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 434.775 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| 434.800 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 434.825 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 |
| 434.850 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 434.875 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| 434.900 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 434.925 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 434.950 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 434.975 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |