PRC-25 & PRC-77 Problem Log
By N3OC
Last Revised 6/13/2013

This is a log of real observed problems in the PRC-25 and PRC-77 series of radios that I have personally experienced and repaired.

It works, but…

If you are checking out a PRC-25 or PRC-77, and you have determined it basically works, but the frequencies are not close, follow this section titled "It works, but…".

Keep in mind the frequency spec of these wideband radios is +/- 3khz. So if your radio is within 3khz of where it is supposed to be, you are done unless you are a perfectionist.

The PRC-25/77 synthesizer is a hybrid system using a phase-locked VCO to derive the mhz portion of the signal, and it mixes it with various crystals to derive the 100khz and 50khz steps. So you have several things to check out with a frequency counter or a service monitor:

1. The 1mhz oscillator coming from module A15 – should be fairly close as it is a low-frequency crystal.
2. The VCO output, which is locked on to the harmonics coming from the A15 module, via the first mixer and several filter networks. Should be within 2khz.
3. The 50khz interval oscillator 5.65, 5.6 and 5.55 (PRC-25 only) section of the A10 (A40 PRC-77) interval oscillator module. Should be fairly close as they are low frequency crystals.
4. The 100khz interval oscillator, ten crystal frequencies from 46.85-47.75mhz, in 100khz steps. This should be within 2khz. This is where the problems develop as these higher frequency crystals age.

To accomplish this, first measure the 1mhz coming from module A15, and it should be very close. This is present any time the set is on.

Then set the dials to 30.50, and look for 42.000 mhz at A14 J2. This should be within 2khz. Then change the dials to 52.50 and look for 64.000 mhz at A14 J2, plus or minus 2khz again. If these are both present and within 2khz, your A9 VCO module is probably OK.

Now check the 50khz interval oscillator by moving the counter to A10 (A40 in PRC-77) J3, and check for 5.6mhz when the dial is on an even freq (like 51.00)

and then 5.65 when the dial is on 51.05. Now put the dial on 51.00 and key the set and check for 5.55 mhz (PRC-25 only). These should all be very close and usually are not a problem. Note that on the PRC-25 you will have to provide +2.5VDC to pin C of the module to properly bias the switching diodes. Move the +10VDC from the transmit to the receive side and check both (all four in the PRC-25) crystals, which should be within 500hz.

Now move the probe to A10 (A40 in the PRC-77) J2, and start checking the ten 100mhz interval oscillator crystals. Start with the dial on an even frequency (like 51.00) and check for 46.85mhz. All these need to be within 2khz, and as the crystals age, they get low in frequency. Rotate the dial through .05 .10 .15 etc and check all ten crystals (46.85, 46.95, 47.05, 47.15, 47.25, 47.35, 47.45, 47.55, 47.65 and 47.75) and write down the frequency error for each.

The transformer tuning (white plastic adjustment) on the A10 module will have a small effect on the frequency, but is mostly to peak the circuits RF output. There is no specific frequency adjustment for the crystals. If you find most are a little off in the same direction, you can try the adjustment to bring them on. Since we almost always use these radios on 51.00mhz, the 46.85mhz crystal is the most important to be correct.

If you cannot get these within 2khz, and they are way off, you can replace the crystal or try to find another interval oscillator.

If all this checks out, your set should be fairly close to the correct frequency. If not, you have other issues in the synthesizer circuit. Most likely the A20 sidestep oscillator needs minor tweaking to bring the set exactly on frequency.

PRC-25 Transmits Off Frequency Around 3-4khz, but Interval Oscillator Checks Out OK

OK your interval oscillator has been checked, but you are still off freq. You can check the 1mhz oscillator but that is such a low frequency it is rarely too far off. Most likely your sidestep oscillator is the culprit. It is a goofy circuit spread over two modules, so any testing of this circuit has to be done with the modules in place in the set, WITH THEIR COVERS ON.

When transmitting, look for 11.451mhz at the test point on the top of the A20 module. If it is off frequency, you have found your problem. Fixing it can be a little tricky. This is covered in the third echelon alignment section in the PRC-25 depot manual.

Remove the A20 module, and take it's cover off. Locate T1, the large coil on the left side of the module. It is likely locked in place with glyptol or paint. You will need to hit it with a heat gun to free it up. It is very sensitive, so you only need to move it a little bit. Give it 1/8 of a turn one way or the other, put the cover back

on (you can leave the screw out) and pop the module back in the set, key it up, and check again for 11.451mhz at the test point. If it got worse, move it back to the original spot and go 1/8 turn the other way. Once the 11.451mhz is within 500hz, then go back to 51.0 and see if the set is on frequency. It probably will be. You can get them within 1khz and this is the secret to getting old cranky PRC-25's exactly back on frequency.

PRC-77 No Transmit Power Out (Receive OK, Exciter OK, transmit measured approx. 0dbm out)

About 0dbm transmit power out, with good receive sensitivity and good transmit mod, just low power out. Turned out to be defective antenna relay K1 on A32 module. Replace K1 (difficult) or replace A32 module (available). Relay K1 is a 12vdc DPDT hermetically sealed relay made by Deutsch Relays, with a Deutsch part number of J18C1P6AS-2 and does not seem to be readily available.

PRC-77 Low Transmit Power Out (Receive OK, Exciter OK, transmit measured approx. +20dbm out or 100mw)

This problem turned out to be a bad A37 IPA module. Q2 was defective in the module. Swapping out the module cured the problem. This module is kind of hidden away in the bottom of the radio. You will need to swing up the receive module section of the chassis to get to it.

Q2 part number is SM-C-620774 which may sub to NTE-128 or 2N3053.

PRC-77 Transmitter Breaks Up or Sputters (Receive OK)

Unlike the PRC-25, the PRC-77 has separate VCOs for the transmitter and receiver. This problem traced to the A38 module, which is the transmitter VCO module (receive VCO module is the A39, the successor of the PRC-25's A9 module).

Flexing or tapping on the A38 module caused the transmitter to break up. The receive was solid and did not break up. The solution is to replace the A38 module, but they do not seem to be readily available.

Opening the module and flexing the boards reproduced the problem. There did not appear to be any bad solder joints or cracked components. However, after flexing some of the components in place, the problem traced to a hard to see bad solder connection on the metal ground bridge that connects the two boards together. It took a lot of time to find this.

PRC-25 Synthesizer Out of Lock, Dead A10 50khz Interval Oscillator

The 5.6mhz portion of the interval oscillator tests fine, but the 46mhz portion of the interval oscillator (A10 module) was totally dead. Turned out to be a cracked 1.8k resistor R3.

PRC-25 & PRC-77 Interval Oscillator (A10) Module Troubleshooting

This module is complicated looking, but very simple to troubleshoot. Verify that the 5.55/5.60/5.65 oscillators are working by connecting a counter or service monitor to J3 test point on the module, and run the radio through transmit and receive with the radio on an even (i.e. 51.00) and an odd (i.e. 51.05) position on the tuning control, and verify all four crystals are working. (The PRC-77 does not have the 5.55mhz crystal.)

Then check the 46mhz oscillator by moving the counter or service monitor to J2 test point on the module, and check each crystal by moving the dial through all 100khz positions (i.e. 51.00, 51.10, 51,20, 51,30 etc) and verify all ten crystals are working and on frequency (+/- 2khz).

If there is a problem, it is very easy to troubleshoot the module outside the radio. Turn the radio to an even mhz position (i.e. 51.00) and carefully remove the A10 module by either holding back the spring clip that engages the tuning knob shaft while removing the module, or sliding a stiff object like a credit card between the spring clip and the module while removing it.

Then get a 9v battery with a 9v battery clip, and connect the red wire to J12-G and the black wire to J12-F to work on the 46mhz oscillator. It is easier to just temporarily solder the red lead to the J12-G pin side of the 1k resistor R18 and

solder the black lead to ground than it is to fool with the pins. Then rotate the wafer switch S1B by hand through the positions and troubleshoot each crystal.

On the PRC-25, to test the 5.6mhz section, connect the red lead of the battery to J12-E to test the receive 5.60 and 5.65 crystals, and connect the red lead to J12-D to test the transmit 5.55 and 5.60 crystals. Then connect two AA batteries in series (3v) from ground to J12-C.

The PRC-77 is a little easier as it does not shift the 5.6mhz section when you transmit, so there are only two crystals to check in this section.

PRC-25 & PRC-77 Leaky Squelch

Both radios use relay K3 to shunt the receiver audio to ground when the radio is squelched. This relay is a 28vdc (oddly enough in a 12v radio but it works) DPDT hermetically sealed relay made by Deutsch Relays. The part number is SM-C-447085 and they are currently available on eBay from userid rf_parts. They do go bad. The symptom is the squelch partially goes quiet, or maybe not at all. The one I observed went partly quiet, but not all the way, with an annoying hiss. Further checking revealed about 8 ohms on the closed relay contact, which should have been 0 ohms.

Replacing the relay corrected the problem. The SM-C-447085 relays are occasionally available on eBay. I have seen two PRC-77s with this problem.

PRC-25 & PRC-77 Receives OK with squelch disabled, but goes dead when put on squelch position.

This problem also traces to a bad squelch relay K3. The other set of contacts are involved in the relay function, and if the relay is bad the radio thinks it is in the relay function even though it is not, and stops receiving. Replacing the squelch relay K3 corrected the problem. The SM-C-447085 relays are occasionally available on eBay.

PRC-25 & PRC-77 Intermittent Audio (handset) Connectors

Unfortunately, these can wear out after thousands of handset connections and disconnections.

If oxidation is noted on the pins, and the handset is intermittent, use a pencil eraser to clean up the gold contacts on the radio's connectors. Make sure to blow out all the eraser debris before reconnecting the handset.

This fixed a couple I worked on to where they were not quite 100% perfect, but were much better and quite usable.

PRC-25 Transmit stops after a few seconds, whine may be heard on tx

First, check the battery. A dead or marginal battery can stop the DC converter when the voltage gets too low. If you hear the whine for a second or two then it stops, check the battery first.

Then check the DC-to-DC converter module A1. They do go bad. The symptom can be full transmit power for a few seconds then suddenly stops, or no transmit at all. The exciter will be heard in a nearby radio, but no watts come out of the antenna jack.

Replace the A1 module. They are available from American Milspec. It is also possible to replace the transistors in the A1 module, but since replacement modules are available it is probably not worth the effort.

PRC-25 & PRC-77 Transmit and receive both off by exactly 1mhz

The synthesizer (FSS) is designed to be rich in harmonics, and achieve lock every mhz. Coarse (mhz) adjustment to the VCO is provided by tuning capacitor C1C and C1D, which change when the mhz tuning knob on the front of the radio is rotated. Fine (khz) adjustment is provided by the interval oscillator (A10) module which is connected to the shaft of the khz tuning knob on the front of the radio.

Since there are minor variations between C1 from radio to radio, the VCO module (A9 or A38/A39) should be aligned in the radio it is to be used in.

If a VCO is not aligned in the radio it is to be used in, the capacitance provided to the VCO by C1C and C1D may be far enough off that it locks to the next mhz above or below the frequency indicated by the radio's tuning controls.

Here are some typical PRC-25 C1C & C1D capacitance readings measured with a capacitance meter from A9J6 pin 5 (C1C) and pin 6 (C1D) to ground with module A9 removed:

Mhz	RCA C1C	BRISTOL C1C	RCA C1D	BRISTOL C1D
30	24.6pf	21.6pf	38.2pf	35.5pf
31	22.3pf	19.7pf	36.2pf	33.6pf
32	20.1pf	17.4pf	33.7pf	31.4pf
40	9.4pf	9.0pf	19.0pf	17.8pf
50	4.3pf	4.3pf	8.2pf	7.6pf
51	4.0pf	4.0pf	7.3pf	6.8pf
52	3.7pf	3.7pf	6.6pf	6.2pf

Note that these values essentially repeat themselves for high band, where 30 would become 53, and 52 would become 75 (add 23).

So if your PRC is off frequency by an exact mhz, look in this area for the problem, and make sure your VCO is aligned in the set you are using it in.

PRC-25 Synthesizer continuously hunting, slow to lock, or will not lock

After verifying A9 is properly aligned, and A10 is OK, it turned out to be a cranky A11 module. The module tested OK in another PRC-25, but just was hard to lock in the original radio.

When it did lock, the VCO voltage was at the extremes, around 4.8 or 5 volts indicating that it had steered the VCO about as far as it could, which accounted for the difficulty in obtaining a lock. Normal locked VCO voltages are around 3.6 volts, maybe 4 but anything over about 4.5 volts indicates the VCO is struggling to stay locked.

After the A9 was correctly aligned in the problem radio, replacing the A11 module locked the VCO perfectly every time. This particular A11 module was the old style and alignment did help some, but it was better to replace it with the improved version of the A11, which is a better circuit than the old version.

PRC-77 Tone Squelch Falsing (annoying sputtering noise)

This was an otherwise perfectly working PRC-77 that unsquelched occasionally, sometimes more often, when no receive signal was present. (Maybe there was a little video being heard, they are pretty wide receivers after all.)

The problem turned out someone had misadjusted R5 on the A54 (tone squelch) module where it was too sensitive and unsquelching occasionally just on noise. Turning R5 down a bit solved the problem. I adjusted it where it would reliably unsquelch on a signal with 1.0 khz tone deviation.

PRC-25 & PRC-77 Low white noise (low IF noise)
PRC-25 & PRC-77 Poor 150hz squelch tone decode

The symptoms of problems in the A21 (receiver IF) module may be normal or slightly normal receive voice level, but low white noise with the squelch disabled, and possibly poor 150hz tone squelch decode.

The IF transformers used in the A21 module are very fragile and prone to damage. This damage can be caused by someone tweaking on them, or can be drop damage causing the head to break off the ferrite transformer slug.

The IF module can be aligned by peaking the white noise with no signal, although the manual will tell you to inject a tone and peak with an AC voltmeter. If you have a good ear, just peak the IF transformers for maximum white noise.

BE VERY CAREFUL tweaking the IF transformers. They are very fragile!!! Some manufacturers waxed them in place, making them almost impossible to adjust without breaking them. If this is the case, leave them alone! They are probably aligned correctly anyway.

Some manufacturers locked them in place with paint, these can probably be aligned. Do not totally remove the slug – there is a cat whisker spring inside that will close up and make almost impossible to put the slug back in. USE A WIDE BLADE screwdriver – the cores are very fragile and if you use a small screwdriver, you will probably damage them. You are after maximum surface area contact here.

If you have a broken one as I did, see if you can find a dead A21 module to use for parts, or just swap the whole module. I was able to replace a transformer from a parts mule module, but it was not easy. A21 modules are available now on eBay. Some seem to work, some do not, so buy two if you need one good one.

PRC-77 & PRC-25 Low Signal on Low Band, Long Antenna Only

This problem showed up on a PRC-77 what tested fine on the 50-ohm antenna jack, but in the field it showed severely reduced range on the long (AT-271) antenna. The short antenna worked fine.

To test this, you need the low band and high band loads and antenna stud adapter that the book references. I turned down the tip of a 5/16 bolt to match the AB-591 lower screw profile, then cut the top off the bolt at the correct length, and soldered an alligator clip to it.

I then prepared a low band, long antenna load of 130 ohms, and a high band, long antenna load of 61.9 ohms in series with a 10pf cap. (To make the 61.9 ohm resistor, start with a resistor of slightly lower value, and file into it slowly until you achieve 62 ohms.)

Then the load is attached, and an RF voltmeter is used to measure the RF output at the antenna stud with the microswitches activated, simulating the long antenna.

In this case, the RF output was obviously way low on low band, long antenna, just like the symptoms. But the other three possible antenna situations were fine, pegging my RF millivoltmeter.

The problem turned out to be the solder tab sticking out of C2A, which tunes the low band, long antenna position along with L4. The solder tab was bent and was touching the outside case of C2, thereby shorting out C2A. (There is normally a DC short on this pin anyway presented by module A32, so there is no way to meter for shorts unless you remove A32 first.)

Once the solder tab was straightened out, the low band, long antenna position would peg the RF millivoltmeter just like a good PRC-77 does.

A note on the dummy resistor values. The book specifies eight watt resistors, but they are not too common. I used one watt resistors, and they worked OK, just as long as you did not key the radio to long. They do get warm, and that is another way to test for proper output.

AM-2060/GRC No 12v output to PRC-25/77

Bad 6.8v Zener diode CR1 on circuit board. 1N5233B (6.0v) is a close match but only a 500mw zener, where the original is a 1w zener.

AM-2060/GRC fried resistors R7 & R8

Two causes for this one, the first one is power hooked up backwards to the AM-2060/GRC.

Second cause is loss of bias to Q1 & Q2. If the wire between the two boards at point E2 opens the bias will be lost, and the current will go max to both transistors. The resistors will begin to smoke, and eventually the audio output transformer will fry too. If the transformer goes, a close replacement is made by Hammond part number 146E but this transformer will not provide the low level output back to the vehicle intercom system, but it will drive the AM-2060/GRC speaker.