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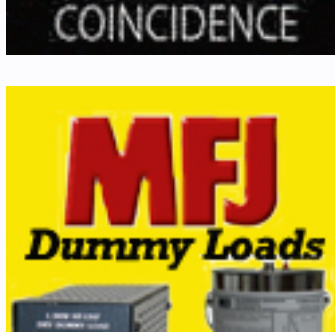
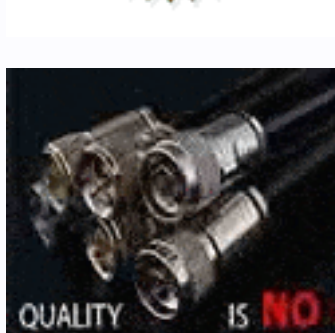
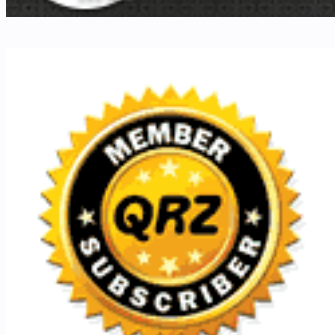
32.185 kursister valgte DEKRA i 2018. 6 ugers kursus med gode jobmuligheder bagefter. DEKRA

ABN

## Push2Tune for the ICOM IC-7300

Discussion in 'Homebrew and Kit Projects' started by WA7ARK, Jan 22, 2018.

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I saw the "Click2Tune" in the Feb 2018 QST (page 57), and being the consummate cheap bastard, decided that I could build a home-brew one. This is a push-button and circuit, that, when plugged into the "Remote Tuner" 4-pin Molex socket on the back of the radio, while pressed, will cause the radio to transmit about 10W of CW RF so that you can tune an external manual antenna tuner at low power without interfering with the internal tuner operation.

First, I looked at the Owner's & Service Manual for the ICOM IC-7300 and for the AH-4 to see if the function of the two control signals is documented. I learned more on the Internet than from ICOM's manuals and did some testing with a temporary cable, a proto-board, and an oscilloscope.

Here is what I discovered: The Molex connector has only four pins:

1. **Key~** (the tilde ~ means that the signal is *active-low*)
2. **Start~**
3. Switched **13.6V power**.
4. **Grd** (chassis ground).

These findings are specific to the IC-7300; I haven't tested other similar ICOM radios. If you have one, you will have to repeat the tests for your radio.

With nothing connected to the **Start~** pin, it sits *low* (about 50mV). In this state, the front-panel TUNER key, the TUNE and TX icons on the LCD screen work to control the Internal Antenna tuner as described in the manual. Furthermore, with **Start~** floating (*low*), the radio ignores the **Key~** pin.

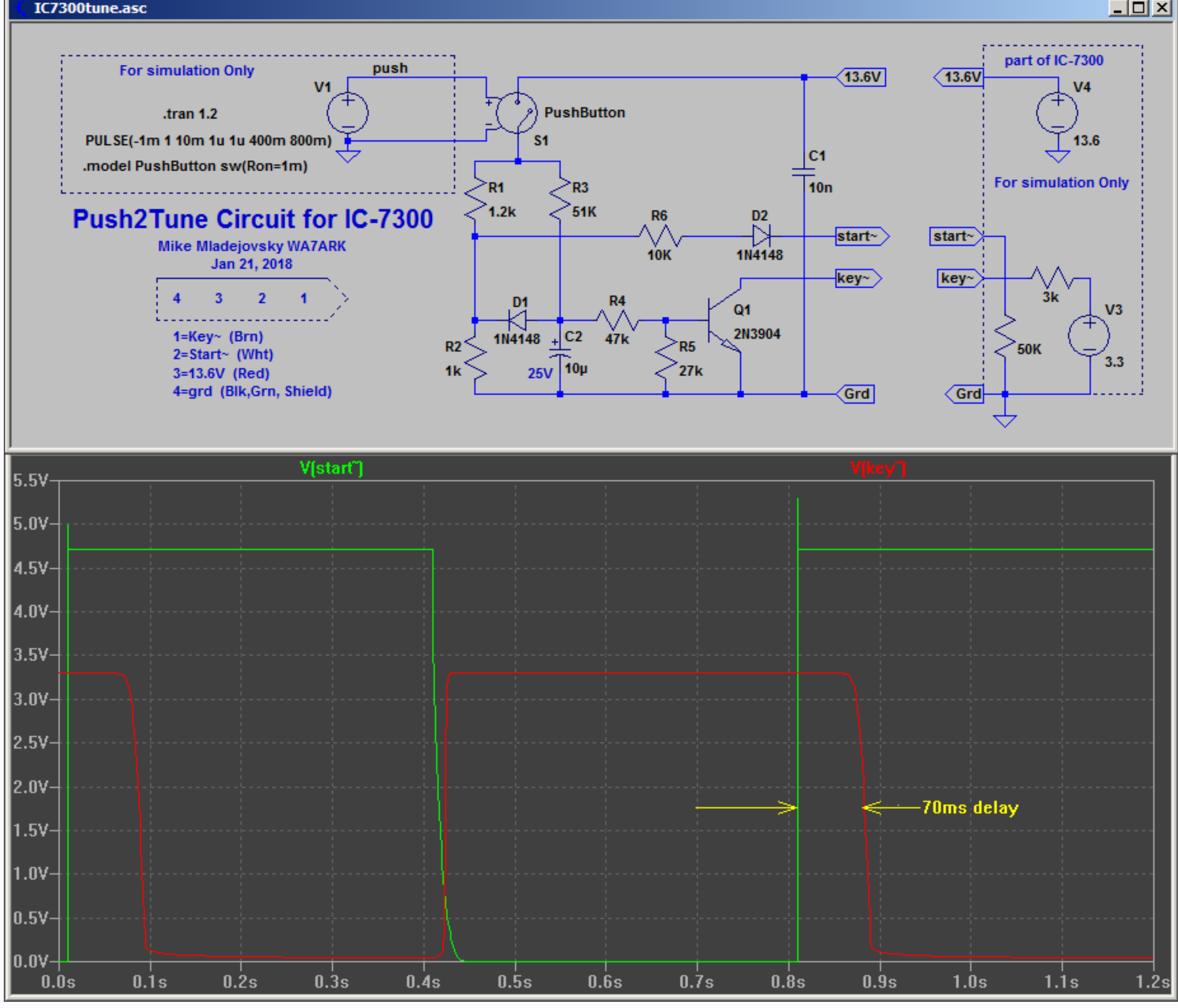
If **Start~** is pulled to about 5V by an external voltage through a suitable resistor, then the IC-7300 detects this, and begins "listening" to the **Key~** pin, which is important to the rest of this discussion.

The **Start~** pin is actually bi-directional (*wired-or*), meaning that when pulled-up by an external resistor, the radio can still momentary pulse the **Start~** pin *low* to signal an external device. This is how the radio normally starts the tuning process if an AH-4 remote tuner is plugged into the radio. This happens when the TUNER key is tapped. This is as documented in the manual in the event the radio is used with the ICOM remote tuner. I am not using this feature of the interface in this design.

The **Key~** pin is pulled *high* (about 3.3V) by an internal-to-the IC-7300 pull-up. With radio having been told to listen to **Key~** (by externally pulling-up **Start~**), then if you wait a while while the radio discovers this, then pull the **Key~** pin to ground, then the radio responds by transmitting the 10W carrier, regardless of mode. This happens for as long as **Key~** is *low*, and stops when **Key~** is released. The radio generates a tone, and shows what is happening by animating the TUNE and TX screen icons.

So, in summary, here is what I learned: In order to preserve the option of using the internal antenna tuner, you cannot permanently just tie **Start~ high**, because that disables the internal tuner. Rather, with the "Push2Tune" button, you have to first generate the **Start~** pull-up signal, wait about 70ms for the radio to discover it, and then pull **Key~ low** for the tuning duration. Upon releasing the "Push2Tune" button, you simultaneously remove the pull-up from **Start~** and allow **Key~** to float, so the radio reverts to the mode where the internal tuner can be used. If the rising edge of **Start~** is concurrent with the down-edge of **Key~**, the radio ignores them.

With all of this in mind, I created my own version of the following "Push2Tune" circuit which is powered from and plugs into the Molex connector. It uses simple-to-get through-hole parts, all of which I had in my junk-box. I built mine on a chunk of Vector board.



The circuit was simulated in LTSpice as shown in the attached schematic. Note the plot of trace V(start~) which shows the push-button being pressed at 0.01s, released at 0.41s, closed again at 0.81s. Note as shown by trace V(key~), this gives the IC7300 about 70ms (0.07s) to detect that the remote tuner interface is active before the Key~ line is switched *low*. **This requirement is the take-away from this project!**

My "Push2Tune" works like a charm. With the "Push2Tune" permanently plugged into the IC-7300, this circuit lets you decide if you want the internal tuner on or not. When using the external tuner, you might want to disable the internal one first, although it is possible (if not useful) to run them in cascade.

WA7ARK, Jan 22, 2018

#1

WL7PM, W1TRY and N4RYK like this.



This confirms why I would never want a rig like that ! (having to have external circlury to overcome the internal logic)

On my rig I just turn the Auto ATU switch off if I don't want to use it.

But well done sussing this out ! I'm sure a lot of people will find this useful.

Roger G3YRO

G3YRO, Jan 22, 2018

#2



Why not just push the "tune" button on the front of the rig? If you don't want the internal tuner, tap it once to disable the internal and then push the "tune" button on your external tuner ? I may have missed something though. Did you just want to build a project?

W8MRL, Jan 23, 2018

#3

AG5DB and W7UUU like this.



W8MRL said: ↑

Why not just push the "tune" button on the front of the rig? If you don't want the internal tuner, tap it once to disable the internal and then push the "tune" button on your external tuner ? I may have missed something though. Did you just want to build a project?

Your procedure works if you have the ICOM AH-4 remote autotuner, or a compatible aftermarket Autotuner. My external tuner is a manually-adjusted T-network, two Cs and a rotary inductor. Say I am set up for LSB, 100W output, and I want to adjust my tuner.

Before building the device:

1. Set the mode to AM
2. Push the Multi knob.
3. Select RF Power from the touch screen.
4. Turn the Multi knob to about 40% (to get about 10W of carrier)
5. Push the Transmit button to begin transmitting
6. Adjust the tuner
7. Push the Transmit button again to stop transmitting
8. Turn the Multi knob back to 100% power
9. Set the mode back to LSB.
10. Radio and tuner now ready.

After building the device;

1. Regardless of mode, power level, band, push and hold the big new button. Radio puts out 10W of unmodulated carrier.
2. Adjust external tuner as needed
3. Release button, radio reverts back to what ever settings existed before.

WA7ARK, Jan 23, 2018

Last edited: Jan 23, 2018

#4



G3YRO said: ↑

This confirms why I would never want a rig like that ! (having to have external circlury to overcome the internal logic)

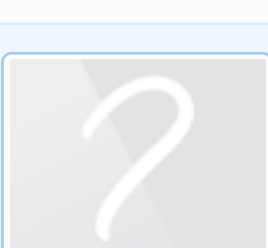
That's ok. I had the rig you have now twenty years ago, and I don't want it back.

On my rig I just turn the Auto ATU switch off if I don't want to use it.

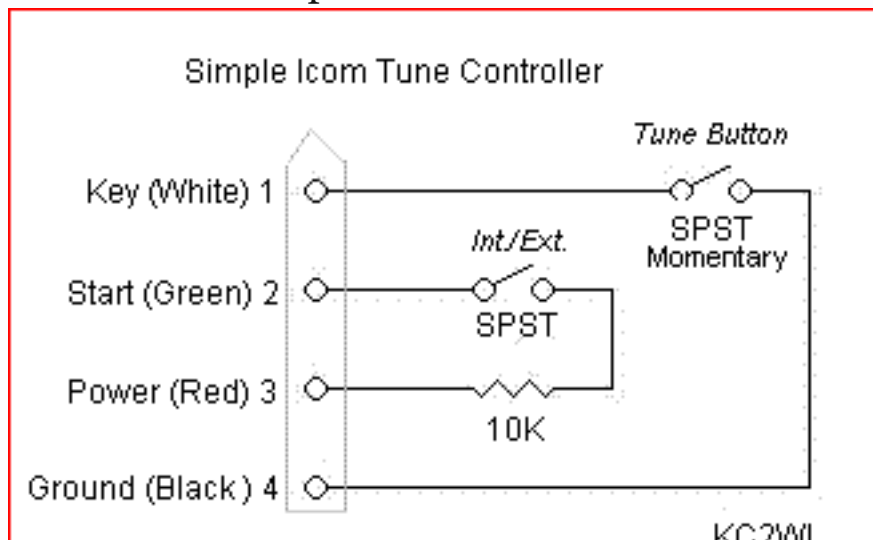
Guess what, the IC-7300 has an internal tuner that you can just switch off if you don't want to use it. I just got tired of going through the steps necessary to get the radio to put out 10W of unmodulated RF carrier so I can adjust my external, big KW manual tuner without stressing it, especially the roller inductor.

WA7ARK, Jan 23, 2018

#5



This is much simpler. You have the on-off switch to choose Int/Ext tuner and the push button to activate the remote tuner.



N4LQ, Feb 5, 2018

#6

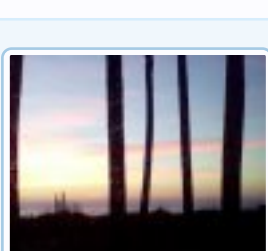
N4LQ said: ↑

This is much simpler. You have the on-off switch to choose Int/Ext tuner and the push button to activate the remote tuner. View attachment 432725

The things that are wrong with the simple circuit above is that you end up having to flip two different switches, and I have read that it can damage the radio to tie the Start~ pin to 13.6V instead of 5V that would otherwise be applied by the ICOM or other aftermarket tuners.

WA7ARK, Feb 5, 2018

#7



N4NYK, Feb 5, 2018

#8

Actually, referring to the two switch arrangement, if a 47k current limiting resistor is used on the start line (instead of 10k), the IC-7300 has a clamping diode to the internal 5V supply. The internal diode is rated for 30mA. The "start" current is limited to about 0.2mA which the clamping diode can easily handle. A 5.1V zener could also be used on the start line in addition to the 47k resistor. That way the clamping diode is not used.

The single switch solution is more elegant, but uses many more parts. Either solution will work.

N4NYK, Feb 5, 2018

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