Quick Take Back – Version 9

I had recently purchased a RadioMaster TX16S and decided to get an external Multiprotocol Module, specifically to use the radio as a wireless trainer. Having used a Spektrum radio as a wireless trainer, I knew that I wanted what Spektrum calls the "Master Override" feature – what we call Quick Take-Back (QTB). Little did I know, I had just fallen down another rabbit hole as I ended up writing my own version of QTB. I took bits and pieces from several things I found, but most helpful was the excellent document from oldpal44 in his post in RC Groups - [Post 175](#).

I believe this version of QTB has several advantages:
- Uses the System -> Trainer page to configure the trainer and Model -> Special Function, Trainer Sticks to enable the trainer mode, just as described in the OpenTx manual.
- Uses only 7 Mix lines (4 channels) and only 6 Logical Switches. Nothing is added to the Input – Mixes – Output signal processing path.
- This means that this QTB change can be added to an existing model without changes to the existing Inputs and Mixes.
- Can be installed using an install script.

This version addresses the following safety issues.
- If the teacher accidently hits the activate switch when there is no student, nothing happens, even if a student radio is turned on later.
- If the trainer signal is lost and recovered control transfers to the teacher and stays there.
- Both the teacher and student must have no stick input to transfer control to the student.

IMPORTANT

> **If you already have QTB Version 8** installed in your model and you are satisfied with how it works, you may not want to switch to Version 9. You will need to remove the changes to Inputs and Mixes you made while installing Version 8 and they are difficult to remove without effecting the flying characteristics of your model, so you might be in for an unpleasant surprise. Version 9 can be easily installed into a new model or an existing model that does not have QTB installed without effecting its flight characteristics.
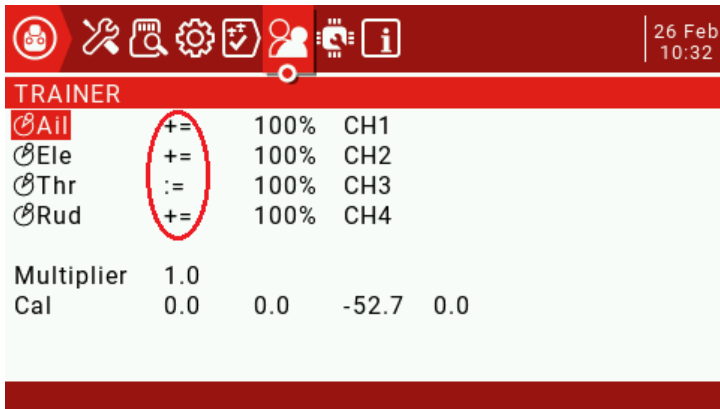
Both the internal and the external Multiprotocol modules default to AETR channel order and it is recommended to set the default channel order on the TX16S to be AETR. The model in the student radio should also be set to AETR channel order. The screens shown below assume this order, but the instructions describe accommodating other channel orders.

All testing has been bench testing, not at the field, so consider yourself a Beta tester. As always, do your own testing and use caution.

QTB Installation

First configure the SYSTEM->TRAINER screen as shown here:

SYSTEM -> TRAINER

Assign the trainer channels to the correct sticks. The picture above is the way it will appear if the teacher radio's default order is AETR and the default channel assignments will be correct if the student radio's order is also AETR. Be sure to verify that the assignments are correct.

The Ail, Ele, and Rud channels need to be set to += for this implementation. Obviously, you never are likely to want the action of the Trainer and Student to be added together and indeed they will not be. When the trainer mode is ON and the teacher is not moving the sticks only student input is sent to the model. Whenever the trainer mode is OFF, only Teacher input is sent to the model. When the trainer mode is ON and there is some teacher stick input, both will be added together, but this situation will last less than a second before the trainer mode is turned OFF. Also note that the Thr channel is set to := because we do not monitor changes in this channel for QTB.

Download and Run the Install Script

QTB Version 9 consists of 7 lines of MIXES, 6 LOGICAL SWITCHES, and 1 SPECIAL FUNCTION line. You can enter these lines manually by following the instructions in the **Implementation** section below, but you can save a lot of time and errors by copying the QTB Install.lua file from the post where you found this document into your SD card at SCRIPTS/TOOLS. Then on your radio, go to SYSTEM->TOOLS and choose "QTB Install" from the list. You may see the following screen. If the Mixes and Logical Switches lines are currently empty, this screen will be skipped.

This is a notification that the lines about to be written by the Install are not empty. If you are aware of this and it is your intention, then tap [ENTER]. If this is a surprise to you, press [RTN] and review the contents of these lines in your model. Either clear them manually or return here and let this clear them for you by pressing [ENTER].

If the Mixes and Logical Switch lines were already empty, or you just erased them, you will see:

This is a notification that the Mixes, Logical Switches, and Custom Function that implement QTB are about to be written. If you press [ENTER] the indicated mixes and switches will be entered. If you tap [RTN] the lines will be left clear.

After the install is complete, you will see:

This is a notification that the Mixes, Logical Switches, and Custom Function that implement QTB have been installed and that the activation switch has been assigned – in this example SH, the momentary action switch on the TX16S. This will be the case for most radios, but there are 5 radio types that do not have an SH switch and 3 of those do not have a momentary action switch.

After the Install, you should verify the installation by reviewing the **Implementation** section that follows. There are 4 places you **may** need to modify:
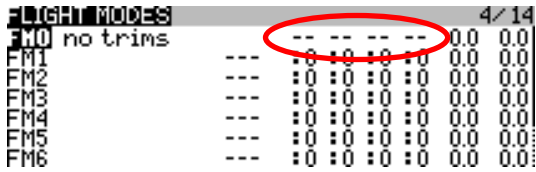
- If you want to use a different activation switch than the one that was automatically chosen, modify Logical Switch L59. Also, check out the option to use a short press of SH in the **Extras** section of this document.
- If your channel assignments are not AETR on both radios you will need to manually edit the 2nd line of each mix for CH30, CH31, & CH32 to agree with the TRAINER screen.
- The install will assume the use of channel 8 to verify the trainer signal presence. If your student radio only has 6 channels, you will need to modify the Source of the CH29 mix to agree with the student radio.
- You can adjust the sensitivity to teacher stick movement by adjusting L60-L62 in the Logical Switches screen.

Check out the **Extras** section to see if you want to use any of the suggestions there.
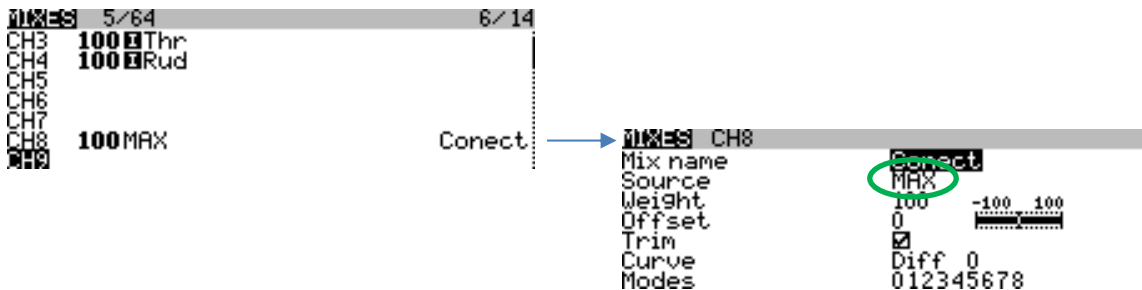
Student Radio

MODEL -> FLIGHT MODES

On the Student radio, create a new, basic model. In the FLIGHT MODES screen, disable trims. The Name isn't required, but it might remind you of why this change was done.

MODEL -> MIXES

I used CH8 as the channel to indicate to the Teacher's radio that the Student radio is still connected. You can pick any unused channel that you wish - it just needs to be one transmitted by the Student radio and received by the Teacher radio. The Mix name isn't required. The mix in the Teacher's radio (CH29 in the MODEL -> MIXES screen, below) must use this same channel as its source. In the Edit menu for this mix, set the source to MAX as shown.

Implementation

Following is a detailed explanation of the implementation, by screen.

MODEL -> MIXES

I found it easy to use channels 29 – 32 for these mixes. You can get to them with a single scroll back or single + button press. They do not interfere with any mixes that your model already has. You can use any channels you wish, just change the Logical Switches screen to agree with your choices. The labels shown are supplied by the installer but are not required if you are entering these manually.

CH29 will let us check to see if the trainer connection is lost.

> The value of this channel will be zero if and only if the trainer signal is lost.

> I chose to use TR8 as a connection indicator. Any channel will work – you must use the same channel assigned on the student radio as documented above.

CH30 will be the Teacher's aileron stick position.

> The items circled in green are the only things you must change from the default values. When the trainer function is ON, Line 1 is (Teacher + Student). Line 2 subtracts the Student's stick position leaving the Teacher's stick position. Note that "Trim" must be off in Line 1. The Source for Line 2 (TR1 in the picture above) must match what was assigned to "Ail" in the SYSTEM -> TRAINER screen above. The Weight in Line 2 must be -100%.

CH31   The same for Elevator sticks.

CH32   The same for Rudder sticks.

The mixes for CH29-CH32 as shown here will be added automatically by the QTB Install script documented above. If the default channel order of your teacher radio or student radio is not AETR, you will need to modify line 2 of CH30, CH31, and CH32 to agree with your SYSTEM->TRAINER screen.

MODEL -> LOGICAL SWITCHES

I found it easy to use logical switches 59 – 64. You can get to them with a single scroll back or single + button press. This keeps them away from existing logical switches that are already part of the model.

L56	---	---	0		---	---	---
L57	---	---	0		---	---	---
L58	---	---	0		---	---	---
L59	AND	SH↓	L60		---	---	---
L60	|a|<x	CH30	10.0	L61	---	---	
L61	|a|<x	CH31	10.0	L62	---	---	
L62	|a|<x	CH32	10.0	!L63	---	---	
L63	a=x	CH29	0.0		---	---	---
L64	Stcky	L59	!L60		---	---	---

59 is ON when the conditions are met to turn trainer mode on.
>The switch to enable trainer mode must be pressed AND the conditions for staying connected (L60) must be met.

L60 is ON when all the conditions are met to allow the Student to remain in control.
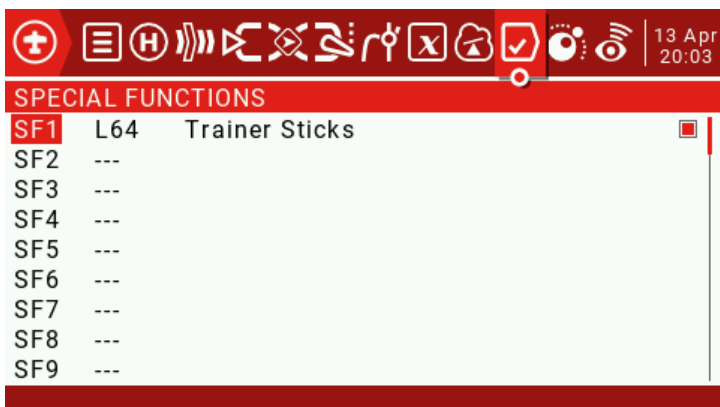>L60 – L63 is one large AND statement which says that the 3 teacher sticks are centered, and the Student radio is connected (CH29 is not zero). The value of 10 in L60-L62 determines the sensitivity of the takeback on the teachers sticks. This is mostly a matter of feel. Smaller numbers mean that even a light touch of the teacher's sticks will grab control. Larger numbers will prevent accidently grabbing control if you might unintentionally move the stick a bit.

L64 controls the status of trainer mode on/off.
>If L59 is ON, even for a short period of time, L64 will be turned ON. If L60 is ever OFF, even for a very short period of time, L64 will be turned OFF.

The logical switches L59-L64 shown above will be added automatically by using the QTB Install script documented above.

MODEL -> SPECIAL FUNCTIONS

SF1	L64	Trainer Sticks	◼
SF2	---		
SF3	---		
SF4	---		
SF5	---		
SF6	---		
SF7	---		
SF8	---		
SF9	---		

The simple one – L64 controls the Trainer mode. The install script will take over an existing Trainer Sticks line if one already exists. If not, it will put this line in the first unused slot of SPECIAL FUNCTIONS. You can move it anywhere you want after installation. If the install script erase function is used, this line will remain, but be disabled.
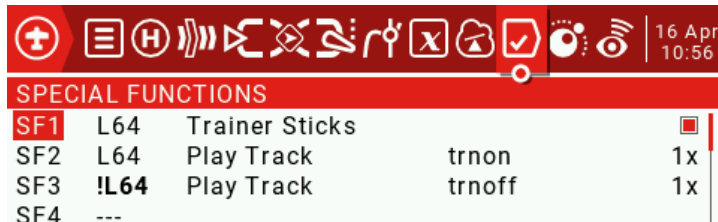
Bench Testing

After everything is set up on both radios give it a bench test. I go to the Logical Switches screen and then press MDL button to bring up the Monitors screen. (Long press Menu on the Taranis X9D+) With the output channels displayed you can verify which radio has control and when control is transferred. If things appear to not be working, you can just exit the Monitors screen and be at the Logical Switches screen to see if the switches are behaving as expected. On the Monitors screen of the TX16S you can press Page< to see the state of the logical switches and press Page< one more time to see channels 25-32. These 3 screens can be very helpful if things aren't working right.

Extras

You can implement QTB with only the information supplied above and that is all that is needed to make it work. However, you can customize it with some of the tips found in this section to make it work your way.

Voice Announcements

You can have the radio tell you when whenever the trainer mode is turned on or off. You do not need to modify any of the Mixes or Logical Switches that are required for the QTB to work. Just add 2 lines to the Special Functions screen:

Press to Activate – Short / Long press of SH

Almost all descriptions of trainer mode use the SH switch to activate, so I did the same. This can be a problem if you have another function that makes sense to be a momentary press of a switch and there is only the SH switch to choose from. This change works on any radio by assigning one function to a short press of the SH switch and another to a long press of the SH switch. For this example, we will use a short press to mean "activate trainer mode" and a long press to mean "reset timer 1". It does require one change to the Logical Switches already entered above.
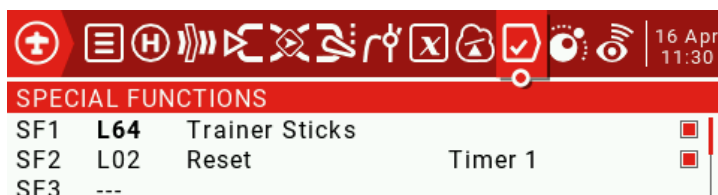
First define 2 logical switches:

L01 will turn on if SH is held down for less than a half second.

L02 will turn on if SH is held down for longer than .7 second.

Now you can modify L59 from the QTB instructions to read:

And add the special function line for your long press of SH:

You can, of course, use any line instead of SF2 and assign any special function you wish to happen on a long press of SH.
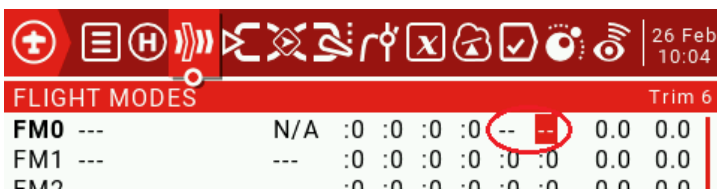
Press to Activate – Unused Trim Switches

The RadioMaster TX16S allows an additional feature. While it appears that SH is the only momentary action switch, there are actually 4 more momentary action switches available. The TX16S has 6 trim switches – the usual 4 plus 2 more, labeled T5 and T6 that can be used in any way you wish. If you have no need for these 2 extra trims, then you can disable the trim usage and use them as 4 momentary action switches. You can also take advantage of this on other radios if you don't use your Throttle trim switch to gain an additional 2 momentary action switches. You can leave the SH switch dedicated to the trainer function and add one of the trim momentary actions this way:

Add the Special Function you want:

This example uses an upward press of the T6 switch. You can, of course, use any line instead of SF2 and assign any special function you wish.

This will work as shown, but you will get that annoying beep and announcements – "Maximum trim reached". To disable the usage of the T5 and T6 switches as trim switches:

Now you have 4 additional momentary action switches to use any way you wish.