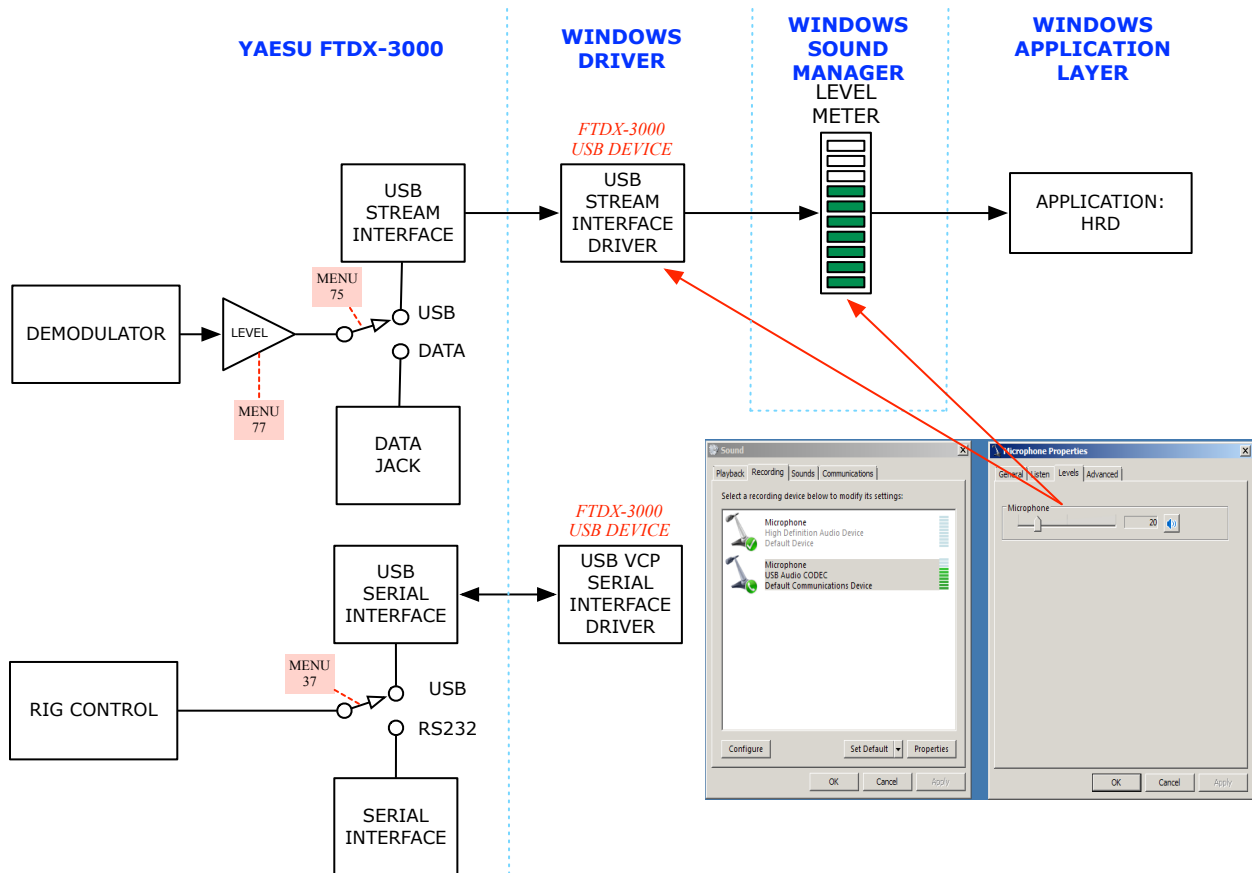# YAESU FTDX-3000 DIGITAL OPERATIONS - OBSERVATIONS AND PROCEDURES

SETTING RECEIVE AUDIO LEVELS

The goals in making this setting include providing an audio amplitude to the computer that does not present an overload condition and allows for some range of control using menu 77 in the FTDX-3000. This is accomplished by setting the level control in Windows to provide some head-room adjustment range in FTDX-3000 menu 77.

1. Open Windows Control Panel.
2. Select **Hardware and Sound.**
3. Select **Sound.**
4. In the **Sound** window, select the **Recording** tab view.
5. Locate the USB Audio Codec device that is the FTDX-3000, right-click on that device and select **Properties.**
6. In the **Microphone Properties** window, select the **Levels** tab view.
7. Set the level control to a value that allows for some range of control when using menu 77 in the radio (recommend 15 to 20).
8. Launch Ham Radio Deluxe.
9. Adjust the value of menu 77 in Ham Radio Deluxe such that the level is as close to generating an overload condition without actually generating an overload condition.

SETTING TRANSMIT AUDIO LEVELS

These instructions result in achieving proper power levels for the high duty cycle present during digital operations, and will result in the best intermodulation distortion on your transmitted signal.

1. Set the transmit power level control to maximum (100-watt) power.
2. Select **Hardware and Sound.**
3. Select **Sound.**
4. In the **Sound** window, select the **Playback** tab view.
5. Locate the USB Audio Codec device that is the FTDX-3000, right-click on that device and select **Properties.**
6. In the **Speakers Properties** window, select the **Levels** tab view.
7. Adjust the level control for maximum.
8. Set menu 76 in the FTDX-3000 to a low value.
9. Make a short transmission with Ham Radio Deluxe while observing the output power level from your transmitter. If the transmitter power output level is lower than 50% of the transmitter power rating (i.e. 50-watts for a 100-watt transmitter), increase the value of menu 76 and repeat this step. If the transmitter power output level is higher than 50% of the transmitter power rating (i.e. 50-watts for a 100-watt transmitter), decrease the value of menu 76 and repeat this step.
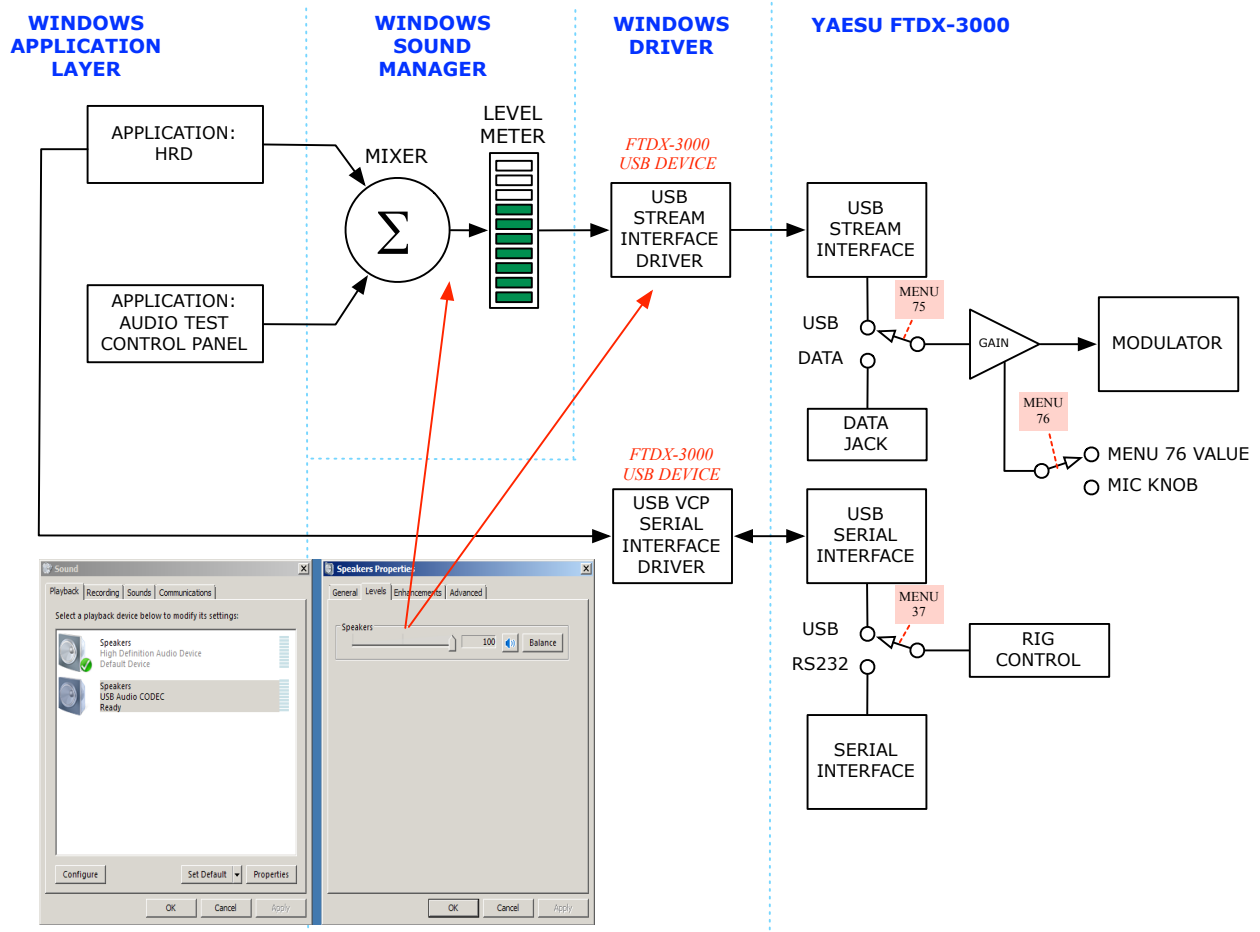
YAESU FTDX-3000 DIGITAL OPERATIONS - OBSERVATIONS AND PROCEDURES

OBSERVATIONS ON FLDIGI FAILURE

The FTDX-3000 menu configurations were:

- Menu 37:   USB
- Menu 75:   USB
- Menu 76:   100 [1]

Keying of the radio was invoked by CAT command using the USB Serial Interface that is built in to the FTDX-3000's Composite USB device (which includes a Serial device, and Audio Control Interface device and an Audio Stream Interface device).

When streaming audio output from any application on Windows (and for Mac OS X for that matter), the application sends audio samples to the operating system's Sound Manager. The audio samples are then mixed with audio samples from other applications. In Windows, a level meter is provided that allows monitoring the amplitude of the output of the Sound Manager mixer, which is also the input to the audio output device driver (which is the FTDX USB Audio Class device driver in this case). It isn't clear to me whether the metering function is part of the Windows Sound Manager or part of the audio device driver framework, but it really doesn't matter in that the amplitude of the audio samples being streamed from the application layer to the audio hardware is being rendered.

Our observation was that when streaming audio from FLDIGI were:

- There was no measurable output from the FTDX-3000 transmitter, as observed on an external power meter.

- The Windows audio level meter showed that the audio stream from FLDIGI was only about 70% of full-scale.

If another audio source was played simultaneously to FLDIGI streaming audio out, such as the Audio Test function that is available in Windows by selecting Properties on the audio device and then clicking on the Test button in the advanced tab, transmitter power output was being observed.

The only difference between the case where no transmitter output was observed and when full transmitter output was observed is that the amplitude of the audio samples, as indicated by the Windows level meter, were at full-scale in the case where transmitter output was observed but only at 70% of full-scale when no transmitter output was observed.

From these observations, it appears that the FTDX-3000 monitors the audio stream from the USB audio stream interface, and only routes the audio from the USB audio stream interface to the modulator when the audio samples are above 70% of full-scale. The exact percent of full-scale where audio is routed to the modulator has not been determined.

When using Ham Radio Deluxe to transmit in PSK31 mode, the observed output level indicated in the Windows level meter is 1-bar less than full scale. This seems to confirm that there is a level sensitive logic threshold in the FTDX-3000 that must be exceeded to enable routing digital mode audio to the transmitter modulator.

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[1] *We also tried the default MCVR setting with adjustments to the Mic Gain knob.*

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If this behavior is verified, I only see two solutions:

- If Yaesu has the capability to change the threshold at which audio is enabled to be routed from the USB audio stream interface to the modulator programmatically, this issue could be resolved by a firmware update to the radio.
- If Yaesu cannot address this issue by firmware update, Application software that does not stream audio samples to the radio at 100% of full scale, such as FLDIGI, would need to be updated to scale the samples up to a 100% of full-scale level prior to sending the samples to the Sound manager.