

RF DRIVE MEASUREMENT AND ADJUSTMENT

5.5.8 RF DRIVE MEASUREMENT AND ADJUSTMENT.

The goal is to put a known amount of power into the tube.



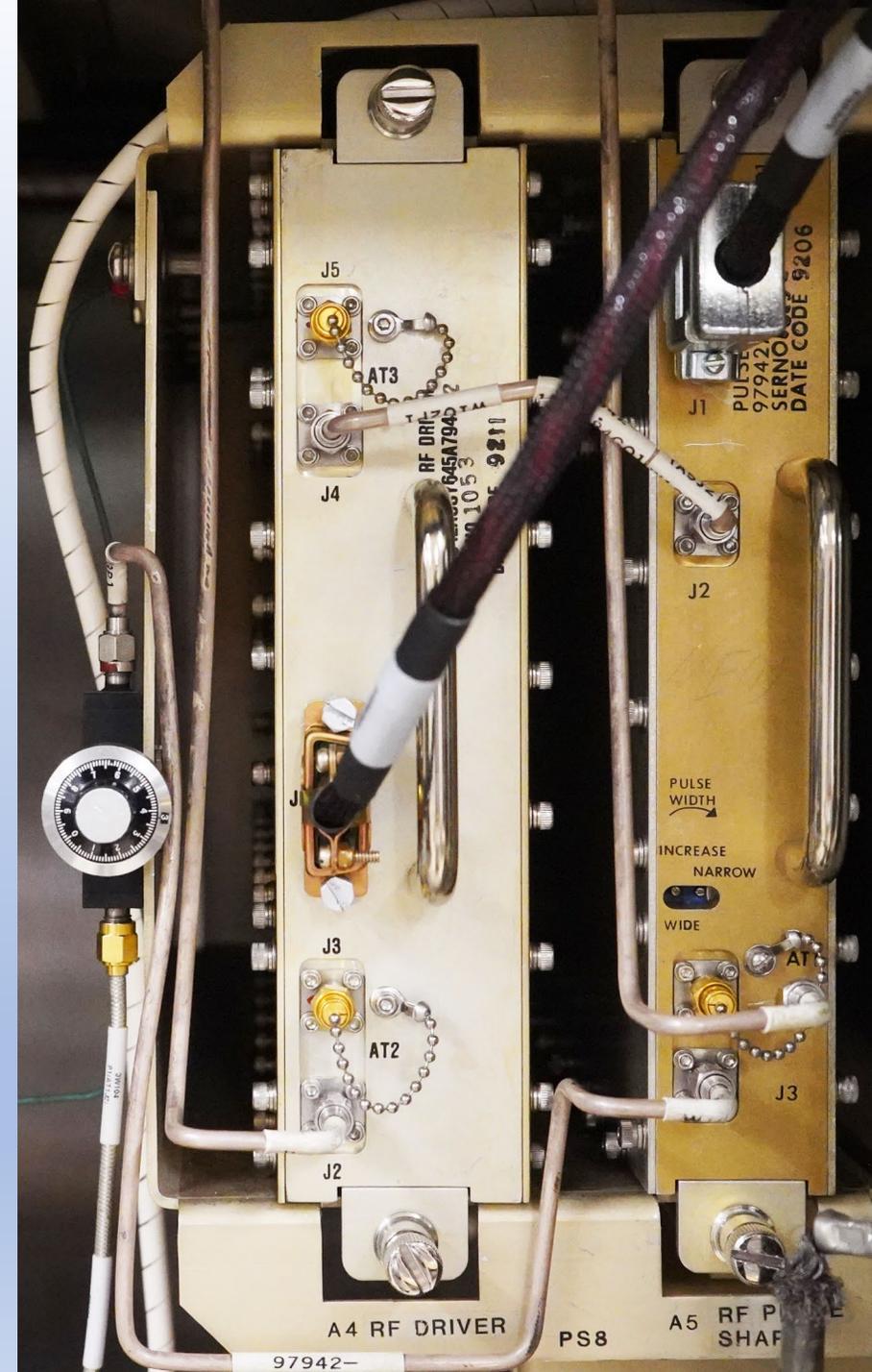
RF power is Amplified by the A4 “RF Driver”

The 8 μ S pulse is trimmed to around 1.4 μ S or 4.5 μ S

by the A5 “RF Pulse Shaper”. The pulse width is set for using the average power meter to set the peak power into the tube. The output pulse width will be set later.

The trimmed pulse is attenuated by the “Variable RF Drive Attenuator ” AT1

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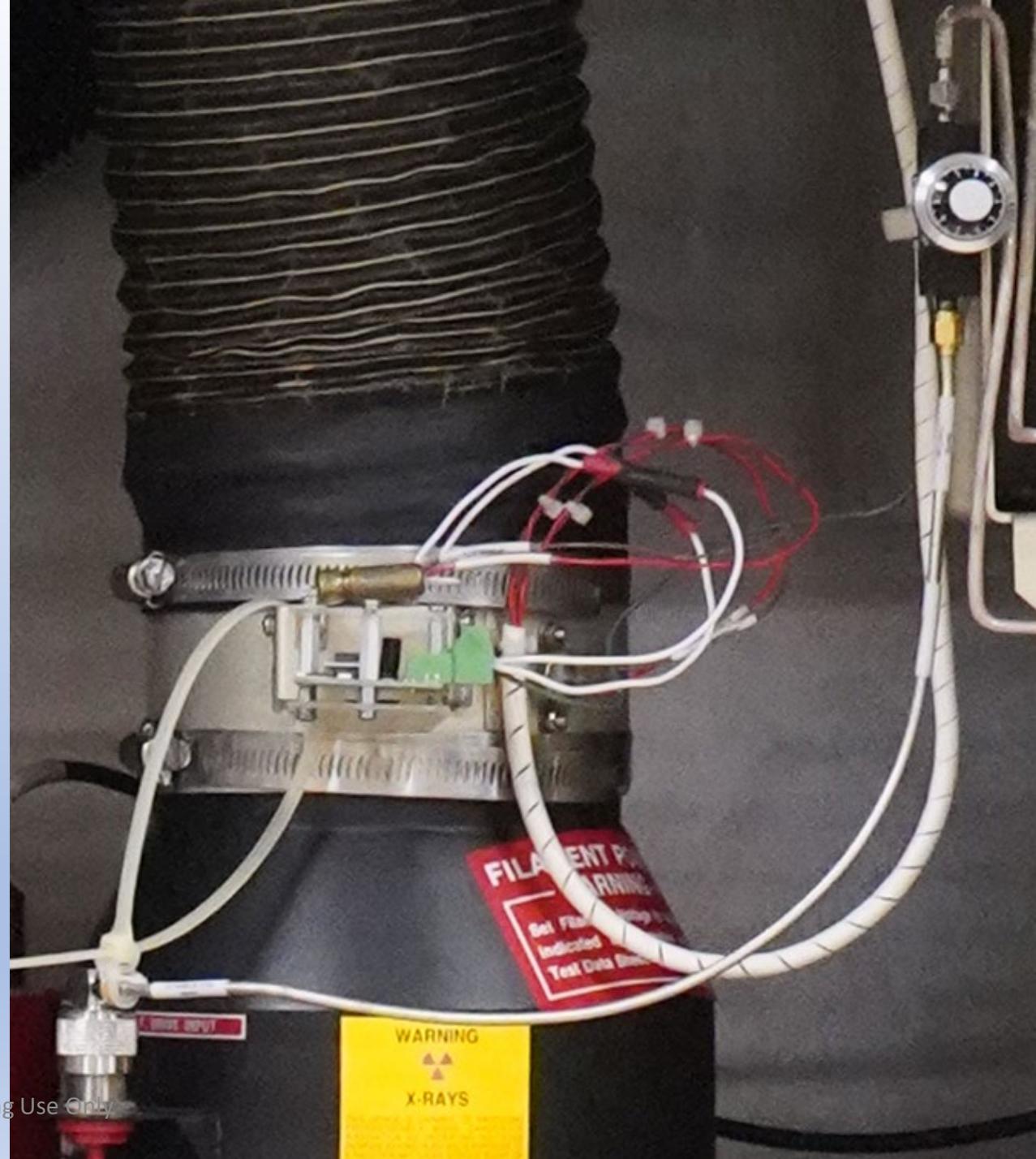


The output of the attenuator goes into the tube. The “N Type” connector into the tube will be disconnected.

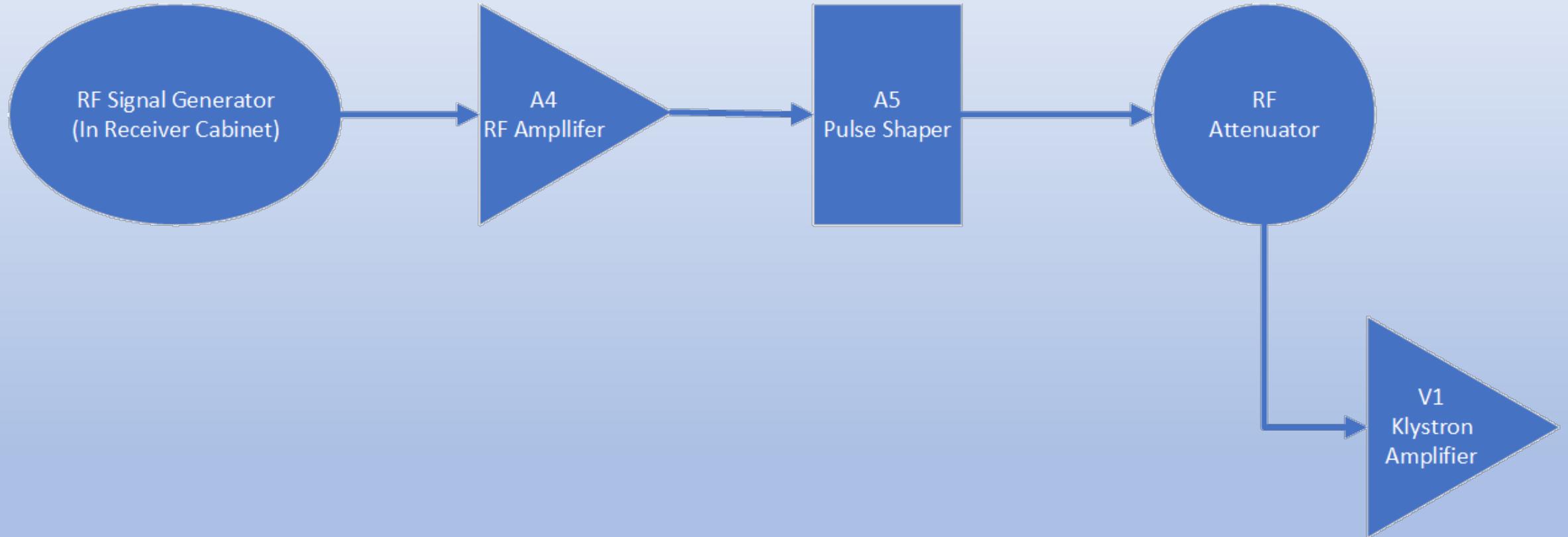
We will measure the pulse width at the input to the tube. If it is outside of specifications, we will adjust it.

After the pulse width is verified, we then adjust the attenuator to the specified power level.

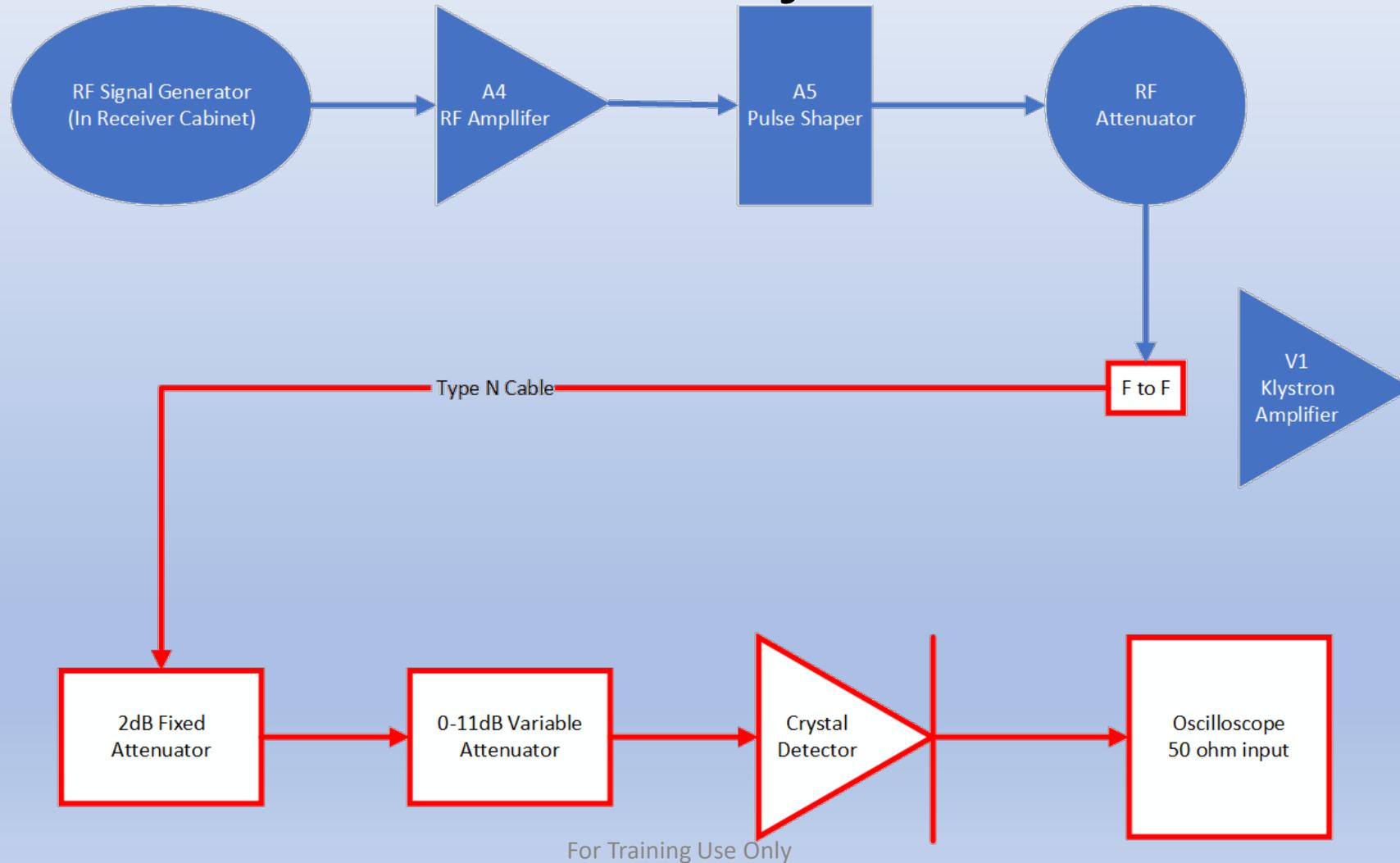
Note: Different brands of tubes are set to different values.



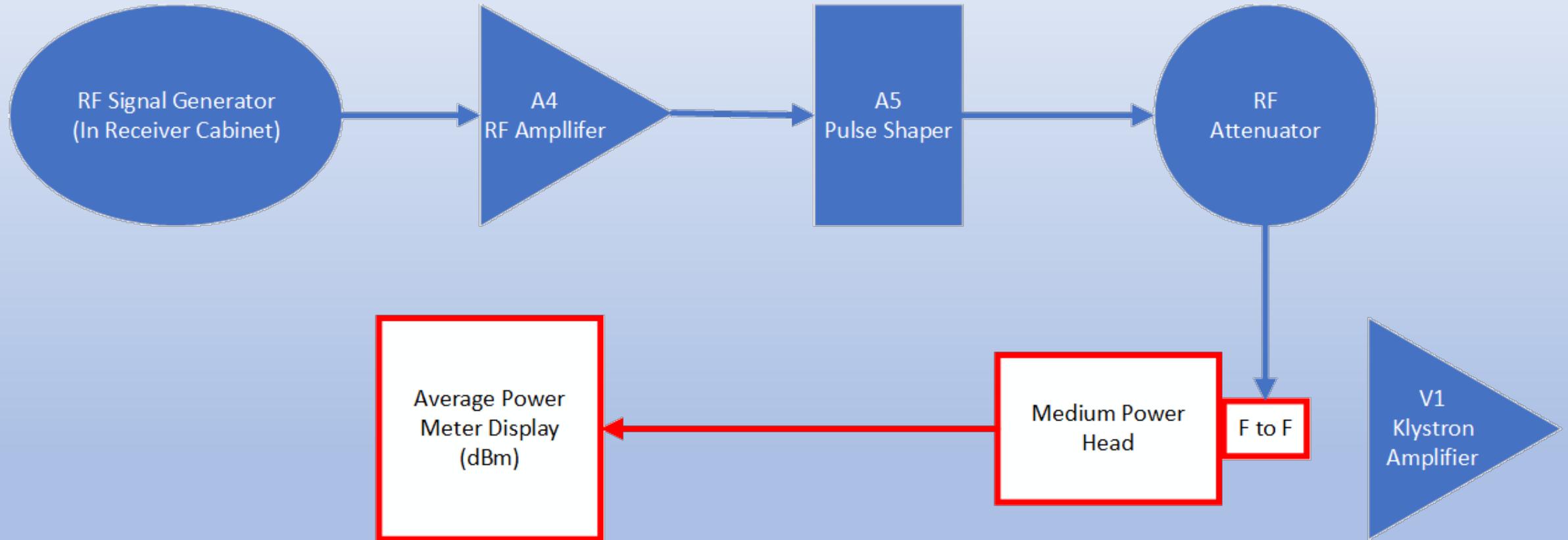
Here is the normal RF path to the Klystron



Here is the configuration to measure the pulse width that will be injected



The average power is measurement configuration



The Procedure

5.5.8 RF DRIVE MEASUREMENT AND ADJUSTMENT.

This procedure is a prerequisite for klystron cavity tuning adjustment (paragraph 5.5.10). It makes a preliminary pulse width adjustment and adjusts Variable RF Drive Attenuator AT1. If short or long pulse widths are adjusted during this procedure, it will be necessary to measure short pulse (TR5) and long pulse (TR6) values and update adaptation data.

NWSTC Note: If this is part of a klystron tuning alignment, TR5 and TR6 will be measured later.

5.5.8.2 Initial Conditions/Preliminary Setup.

WARNING

Hazardous voltages are present within the transmitter cabinet. Take all standard precautions against electric shock. Failure to comply may cause serious injury or **DEATH**.

1. Gain control and place system in standby by performing the procedures in paragraph 3.4.1.2, steps 1 and 2.
2. Calibrate the Power Meter HP436A and Power Sensor **HP8481A** per paragraph 3.4.4.

5.5.8.3 Procedure.

1. Disconnect cable 3/103W104 from the RF input to the klystron.
2. Verify all RF Driver A4 and Pulse Shaper A5 SMA connections are tight by using the SMA torque wrench.

CAUTION

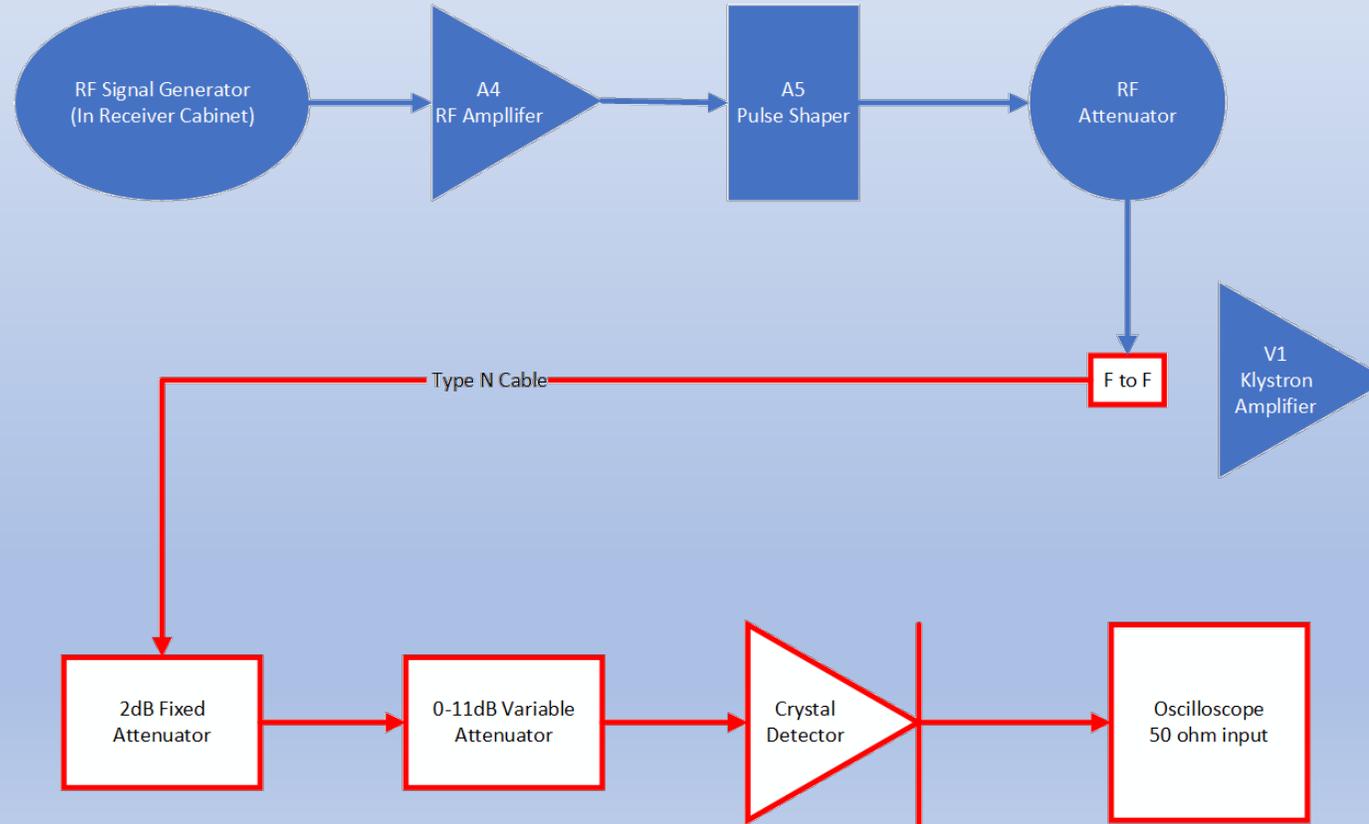
Support the cable to avoid damage to cable 3/103W104.

3. **Support cable 3/103W104**, and connect the Type-N test cable to 3/103W104 P2 end using a Type-N (F-to-F) adapter.

NWSTC Note: The cable from the attenuator to the tube is a small SMA cable, the heavy "Type-N" cable will be too heavy and may be damaged. You can have someone hold it or be creative. If you use nylon wraps, inspect them and replace them if there is any question or if their age is unknown.

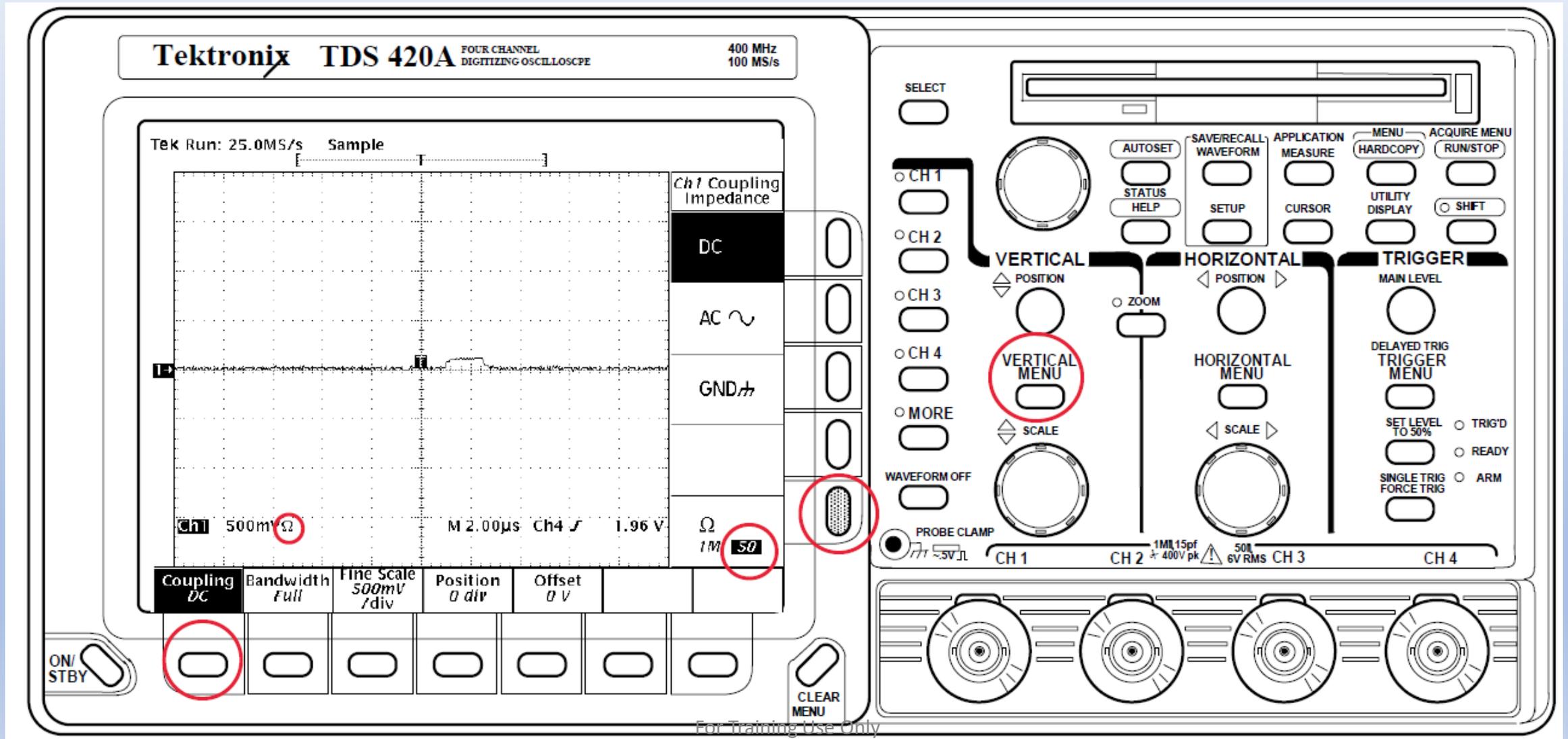


4. Connect the other end of the Type-N cable to a 20 dB fixed attenuator.
5. Connect the 20 dB attenuator to the 0 to 11 dB variable attenuator.
6. Set the variable attenuator to 4 dB.
7. Connect the other end of the variable attenuator to the crystal detector. Connect the crystal detector to a BNC Tee adapter on channel 1 of the oscilloscope.



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8. Terminate the BNC cable using 50 Ω of termination. This may be done by setting the oscilloscope input impedance to 50 Ω in most cases. If this feature is not available on the oscilloscope in use, connect an external 50 Ω terminator using a BNC Tee adapter at oscilloscope input.



9. On the Main RDA HCI, click on **System Test Software** and **Yes** to confirm. Click **Control ► Transmitter Control**; and select the following:

PFN: **Narrow**

RF Drive/Triggers: **On**

Transmitter Control

PFN: Narrow Wide

High Voltage: Off On

RF Drive / Triggers: Off On

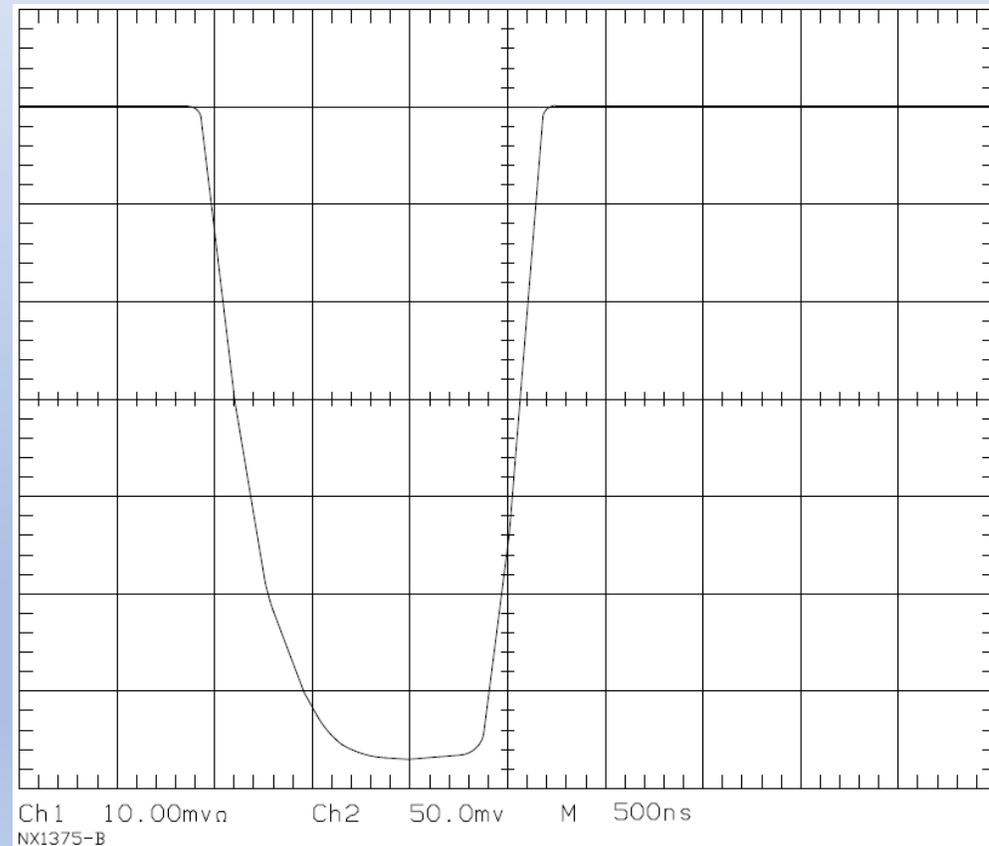
Waveform: Surveillance Doppler Batch Staggered PRT

PRF (Hz): 326.09 ▼
451.81 ▼
574.71 ▼

Close

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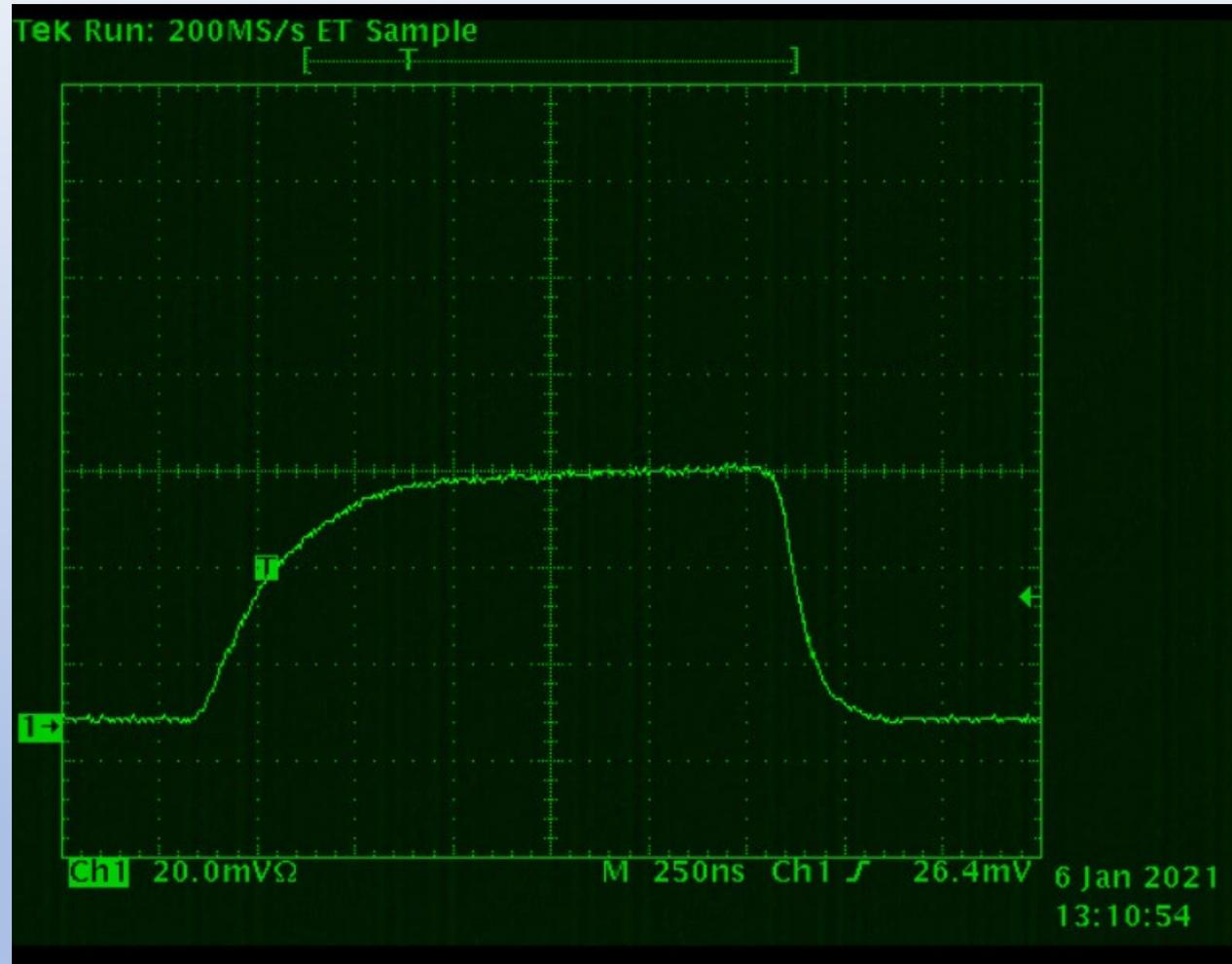
10. Set the oscilloscope horizontal sweep spread to 0.5 $\mu\text{sec}/\text{div}$ (500 nsec). See Figure 5-7.
11. For digital oscilloscopes: Trigger to channel 1, positive slope.
For analog oscilloscopes: Trigger to RF Pulse Start on the Transmitter Control Panel A1.
12. Adjust triggering so pulse is visible on the oscilloscope.



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Figure 5-7. RF Drive Waveform

13. Set the oscilloscope V/div and vertical position controls to display the peak of the pulse at the center graticule line. Once set, do not adjust vertical position until after measurements are made.

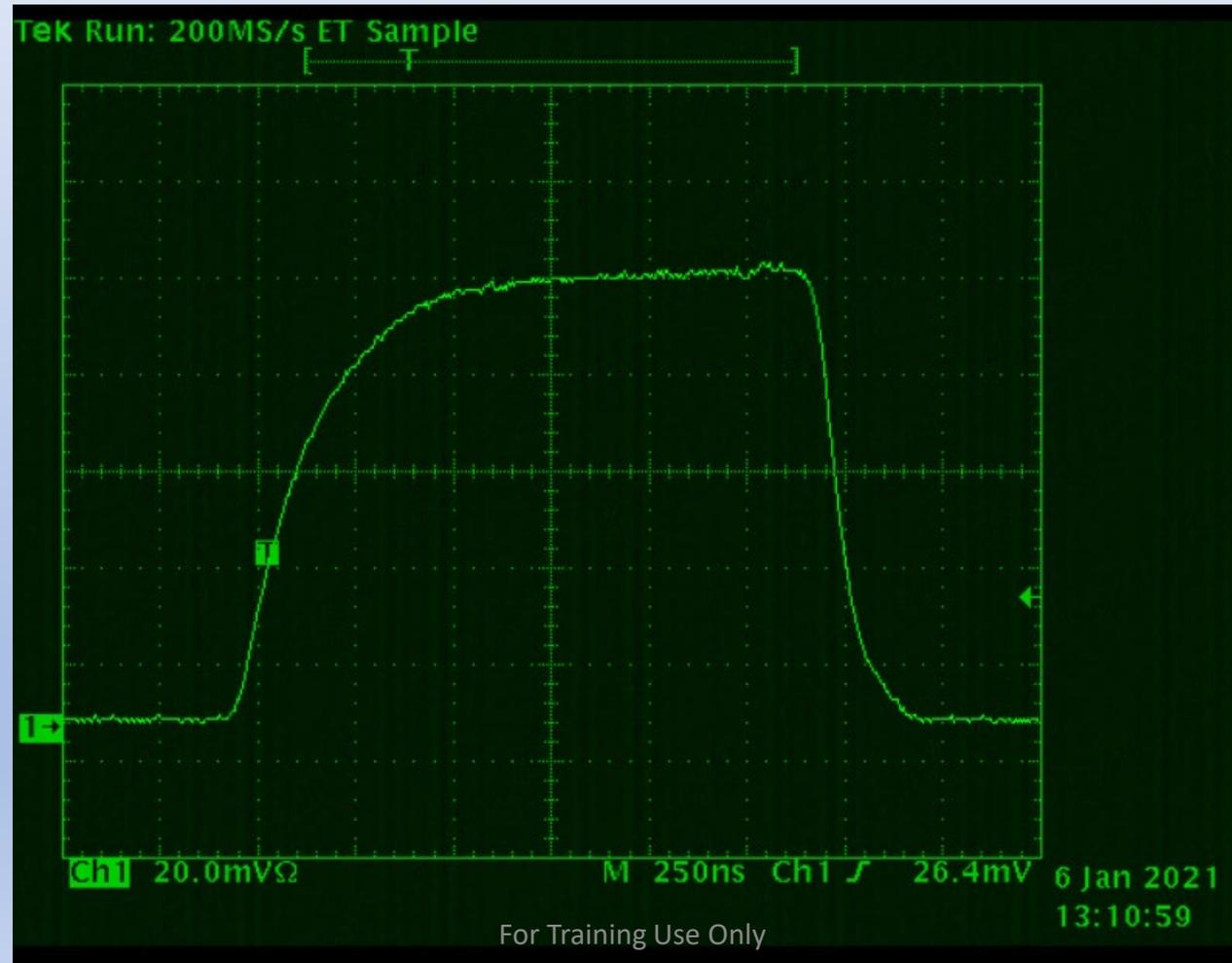


14. If pulse is not visible, slowly increase the dial on the Variable RF Drive Attenuator AT1 until the RF drive pulse can be seen.

15. Remove 4 dB from the variable attenuator.

NOTE

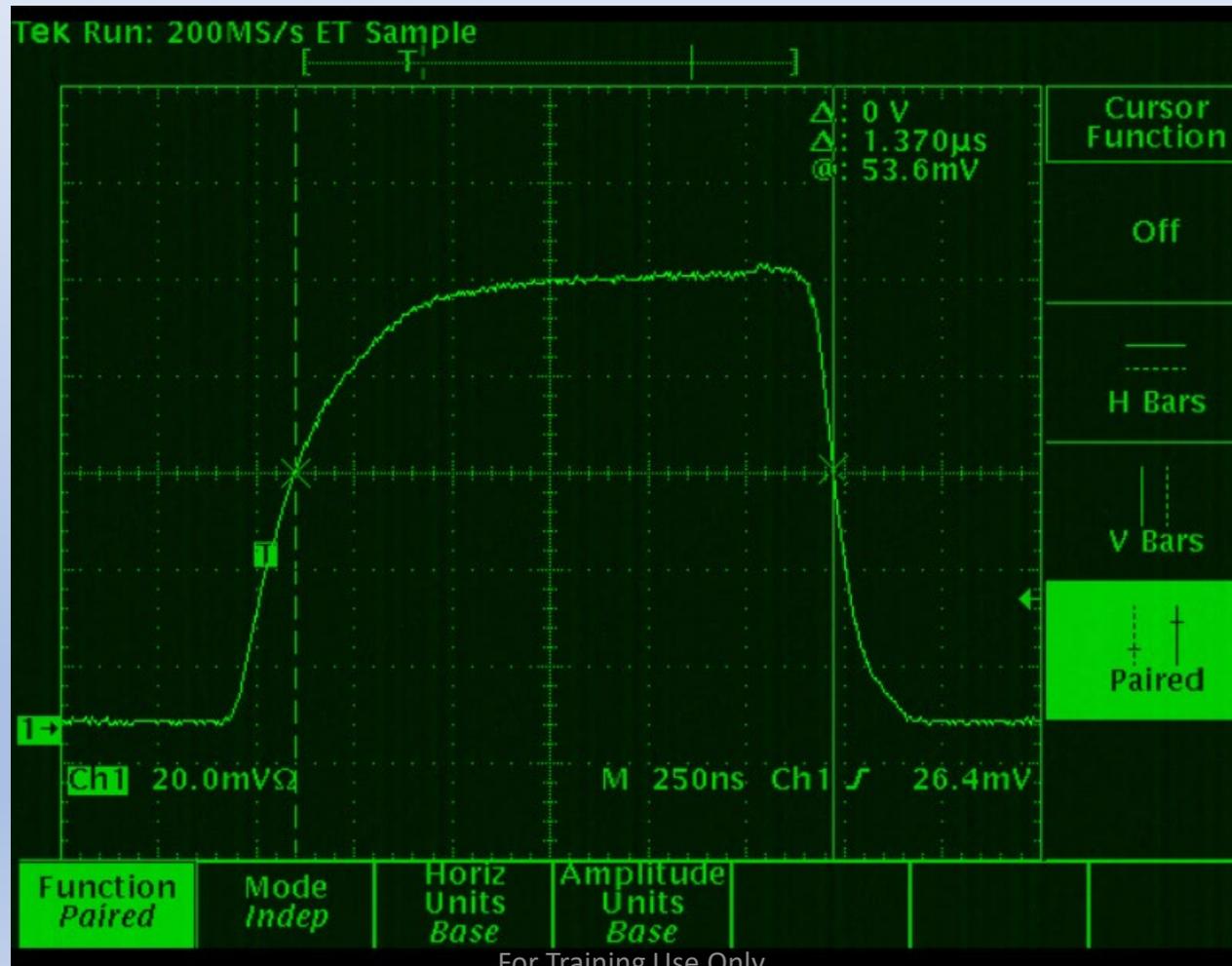
Once set, do not adjust vertical position until after measurements are made.



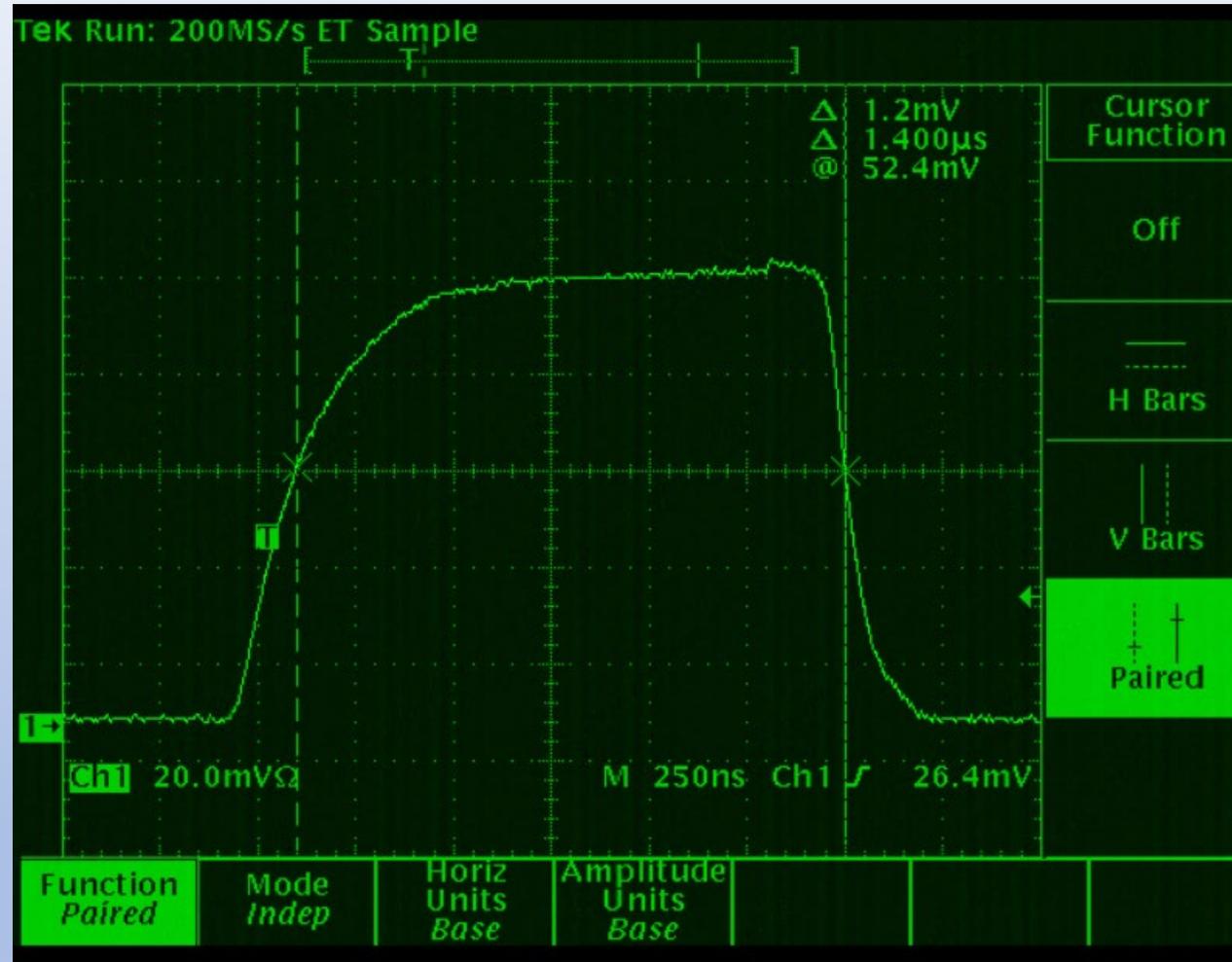
16. Adjust the vertical time cursors so they are on the leading edge and trailing edge of the pulse at the center graticule line (previous 100% level).

NOTE

This measurement represents the 4 dB down pulse width in long pulse.



17. If the pulse width is not $1.4 \pm 0.05 \mu\text{sec}$, adjust A5R4 which is marked NARROW on the Pulse Shaper A5 until the pulse width is $1.4 \mu\text{sec}$.



Klystron Cavity 4 adjustment and Rise Time Measurement

NWSTrainingCenter

2:52

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<https://www.youtube.com/watch?v=JY9vkNiVf4&list=PLYsC5TDceCYX2TqR3sLmPVebljVipU1&index=4>

18. Insert the 4 dB back into the variable attenuator.

19. In the Transmitter Control window, select the following:

PFN: **Wide**

*Doing the same
thing for the wide
pulse*

The image shows a software window titled "Transmitter Control". It contains several configuration options:

- PFN: Narrow Wide
- High Voltage: Off On
- RF Drive / Triggers: Off On
- Waveform: Surveillance Doppler Batch Staggered PRT
- PRF (Hz): 326.09 (dropdown menu)
- PRF (Hz): 451.81 (dropdown menu)
- PRF (Hz): 574.71 (dropdown menu)

At the bottom right, there is a "Close" button. At the bottom center, it says "For Training Use Only".

20. Set the horizontal sweep speed to 1 $\mu\text{sec}/\text{div}$.

21. Set the oscilloscope controls to display the peak of the pulse at the center graticule line. Once set, do not adjust vertical position until after measurements are made.

22. Remove 4 dB from the variable attenuator.

NOTE

Once set, do not adjust vertical position until after measurements are made.

23. Adjust the vertical time cursors so they are on the leading edge and trailing edge of the pulse at the center graticule line (previous 100% level).

NOTE

This measurement represents the 4 dB down pulse width in long pulse.

24. If the pulse width is not $4.5 \pm 0.1 \mu\text{sec}$, adjust A5R7 which is marked WIDE on the Pulse Shaper A5 until the pulse width is $4.5 \mu\text{sec}$.

NOTE

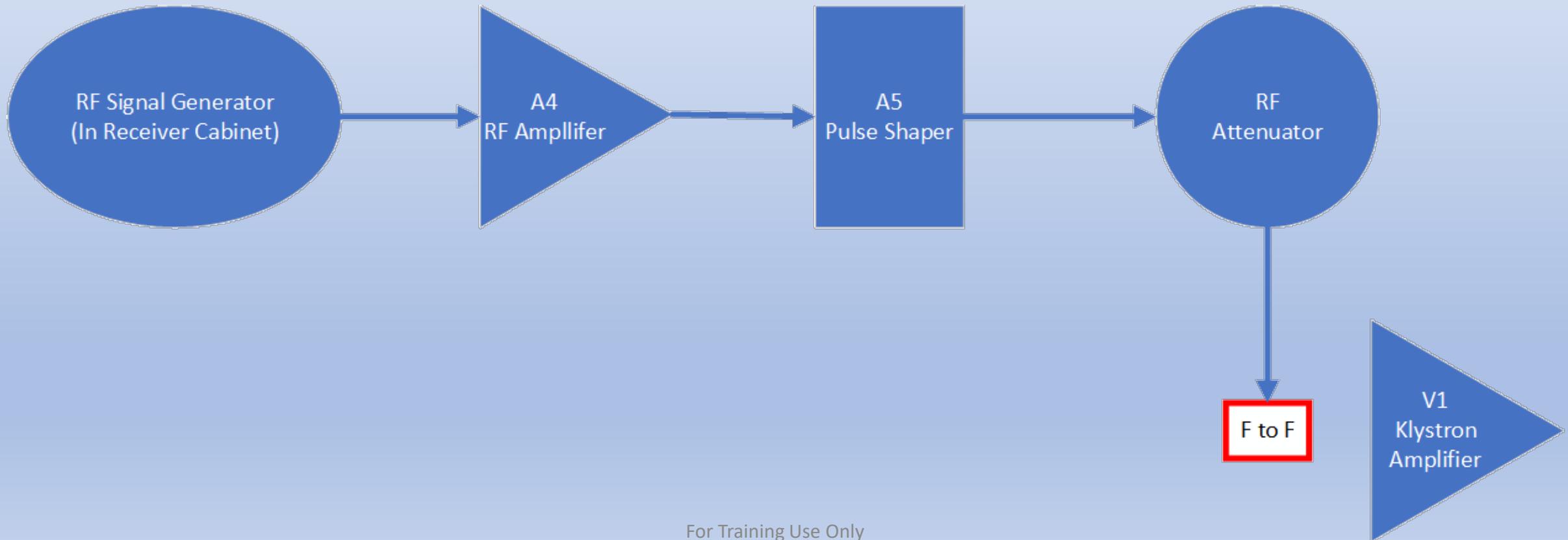
This completes the checkout portion of the procedure. If performing this procedure as part of a transmitter tune, continue with step 25. If performing the procedure only to verify RF drive input, skip to step 31.

NWSTC Note: This completes the pulse width measurement.

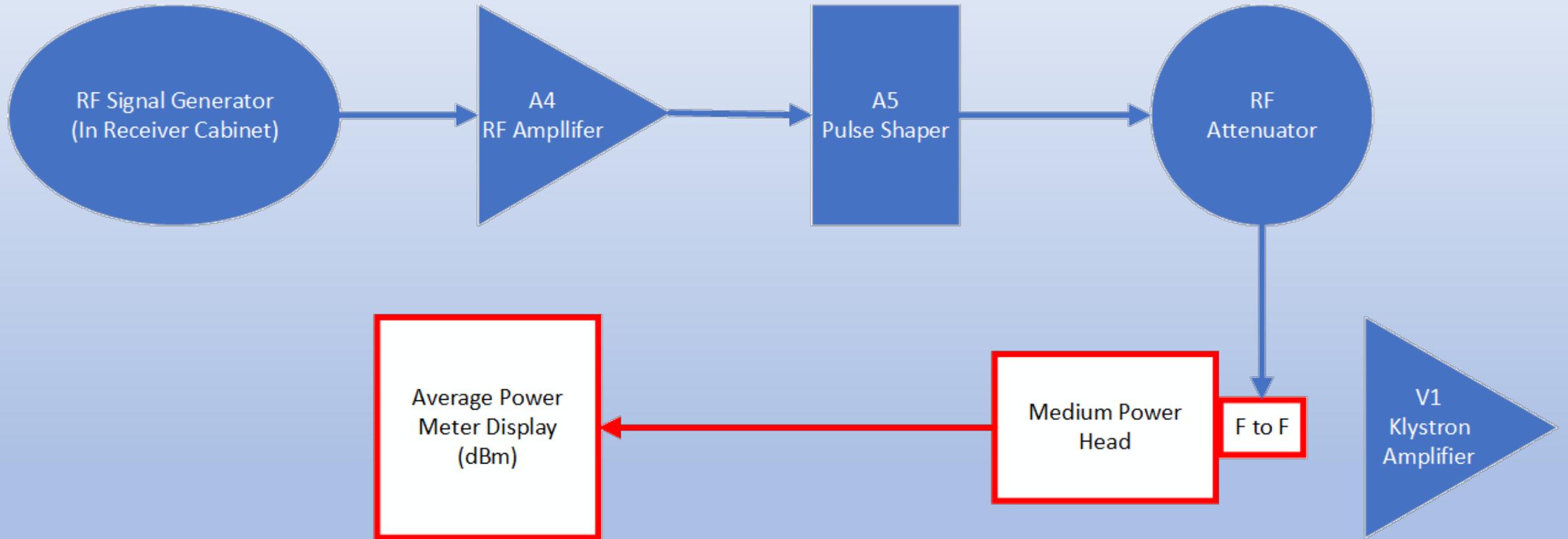
25. Disconnect the Type-N cable from the Type-N (F-to-F) adapter. Remove the 20 dB attenuator.

CAUTION

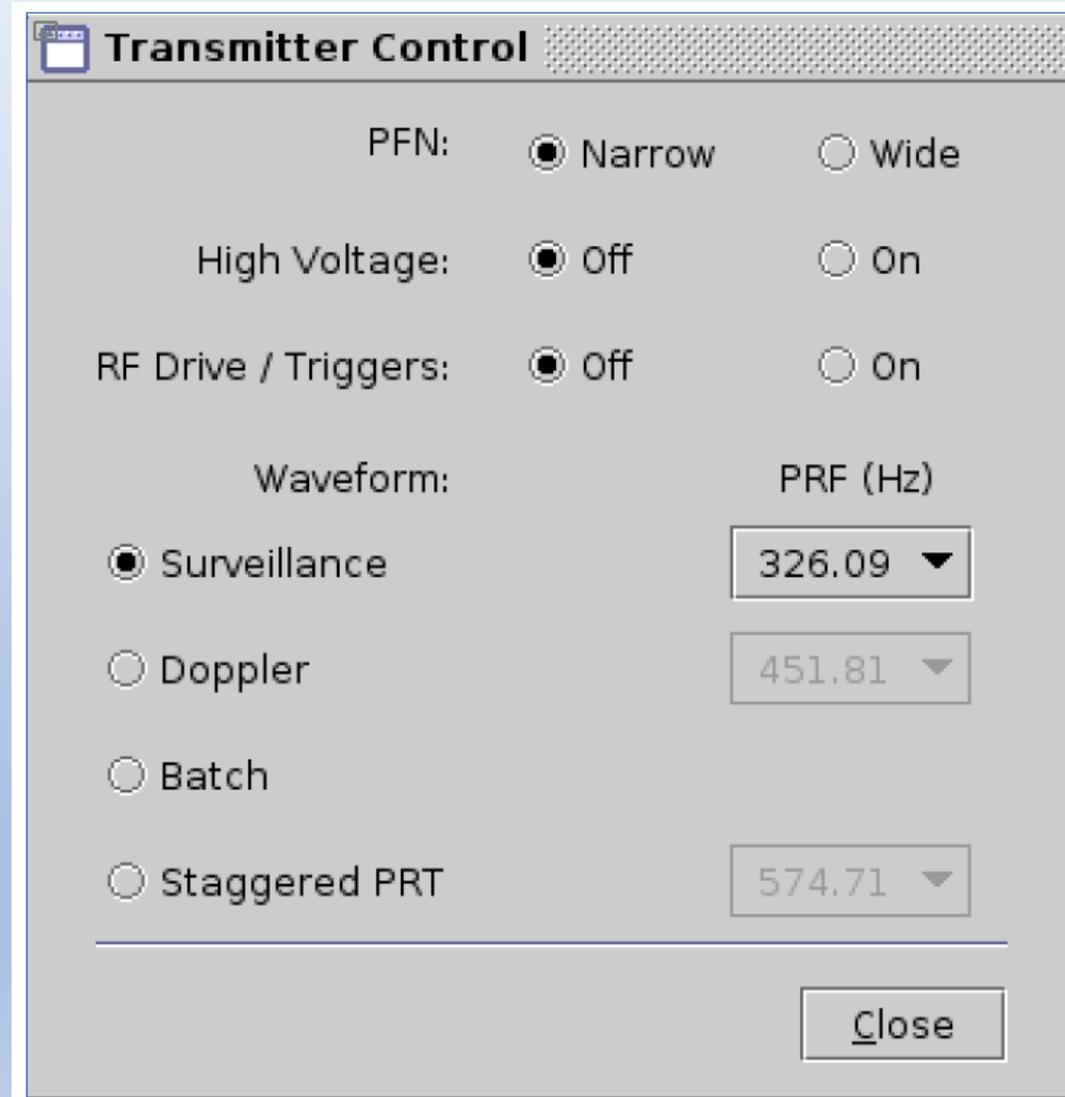
Make sure to support the power sensor to avoid damage to the semi-rigid cable 3/103W104.



26. Connect the power sensor to cable 3/103W104 through the Type-N (F-to-F) adapter.



27. In the Transmitter Control window, select the following:
PFN: **Narrow**



The image shows a software window titled "Transmitter Control". It contains several configuration options:

- PFN: Narrow Wide
- High Voltage: Off On
- RF Drive / Triggers: Off On
- Waveform: Surveillance Doppler Batch Staggered PRT
- PRF (Hz): 326.09 (dropdown menu)
- PRF (Hz): 451.81 (dropdown menu)
- PRF (Hz): 574.71 (dropdown menu)

A "Close" button is located at the bottom right of the window.

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28. Note the attenuator dial reading.

Attenuator Dial Reading _____

NOTE

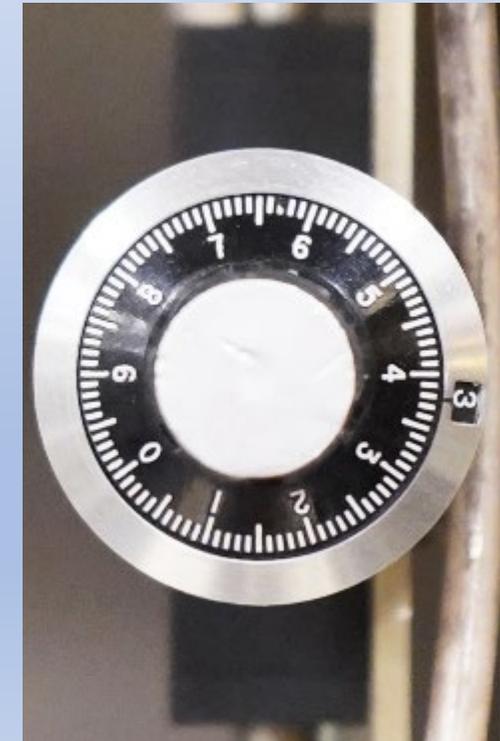
There is considerable free motion in the attenuator dial. A specific dial reading should always be approached in the CW direction. Take care to avoid going beyond the specified dial reading.

NWSTC Note:

Does it read 3.38 or 338?

*It does not matter. It is a reference mark.
It is a mark that is NOT on a calibrated
scale and referenced to an unknown
standard.*

Just make a note as you want.



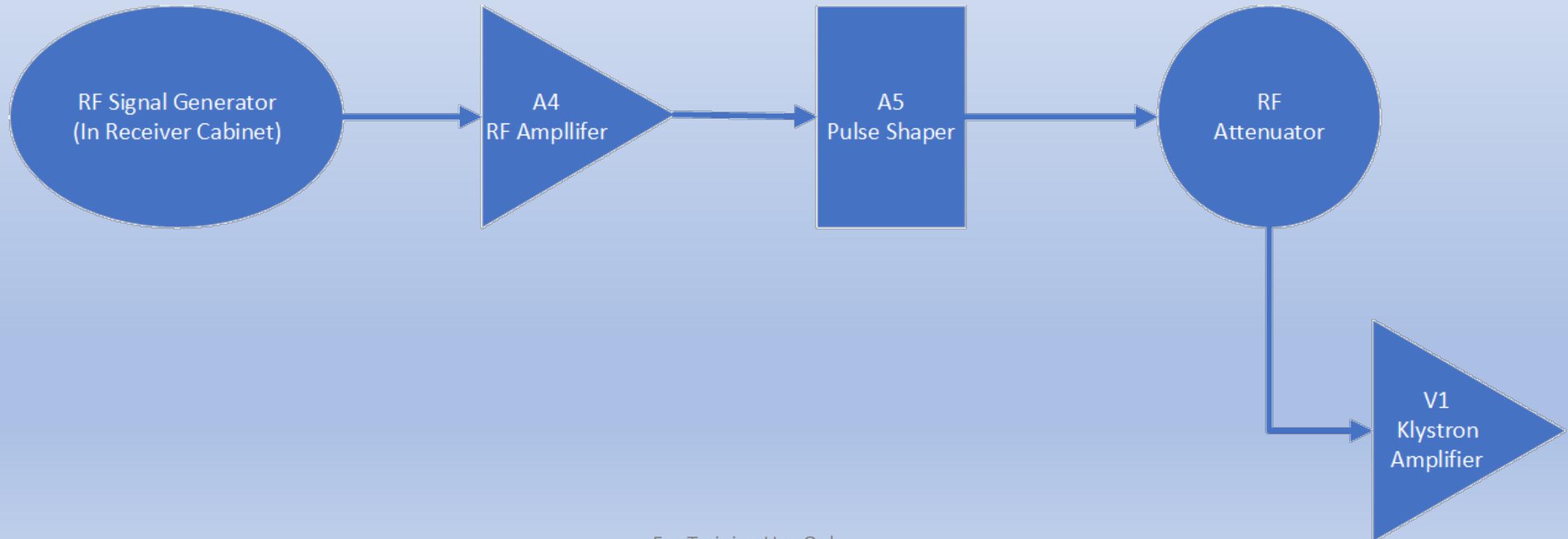
29. Adjust the Variable RF Drive Attenuator AT1 CW until the meter reads the following:

- a. For CPI klystron tube, set to -1 dBm.
- b. For Litton (L3COM) klystron tube, set to 5 dBm.

30. Note the attenuator dial reading.

Attenuator Dial Reading _____

31. Remove all test equipment and reconnect all cables removed during the procedure.



32. Close all System Test Software windows by clicking **Close**, **File** and **Exit**. Click **Yes** and **OK** at pop-up windows.

33. If performing the klystron tuning alignment, continue to the RF Bracketing Adjustment per paragraph 5.5.9. Otherwise, if pulse width adjustments were made, proceed to the Transmitter Pulse Width Adjustment TR5 and TR6 per paragraph 5.5.12.