

Enhanced Source Transfer PCB

Part Number:	700008907	Where Used:	Xevo TQ-S
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Functional description



- The source transfer PCB provides a combination of RF voltage, bias and T-Wave pulse to the StepWave assembly.
- The following components also receive their voltage from this board; sample cone, source offset, Diff Ap 1, and Diff Ap 2.
- The source offset voltage is applied between the ion block and the StepWave (see the "Diagnostic procedures" section for more details).
- The cone (V) is created by applying an offset between the first and second sections of the StepWave (see the "Diagnostic procedures" section for more details).

WARNING: Suitable precautions must be taken when working on the PCBs as RF and high voltages are produced.

CAUTION: The source transfer PCB may be damaged by static discharge. Ensure that suitable antistatic precautions are used at all times when handling this board.

Location

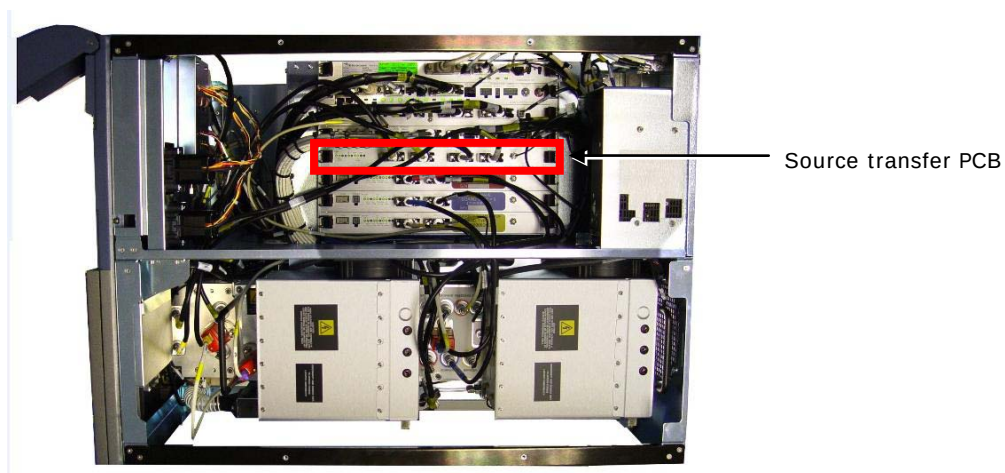
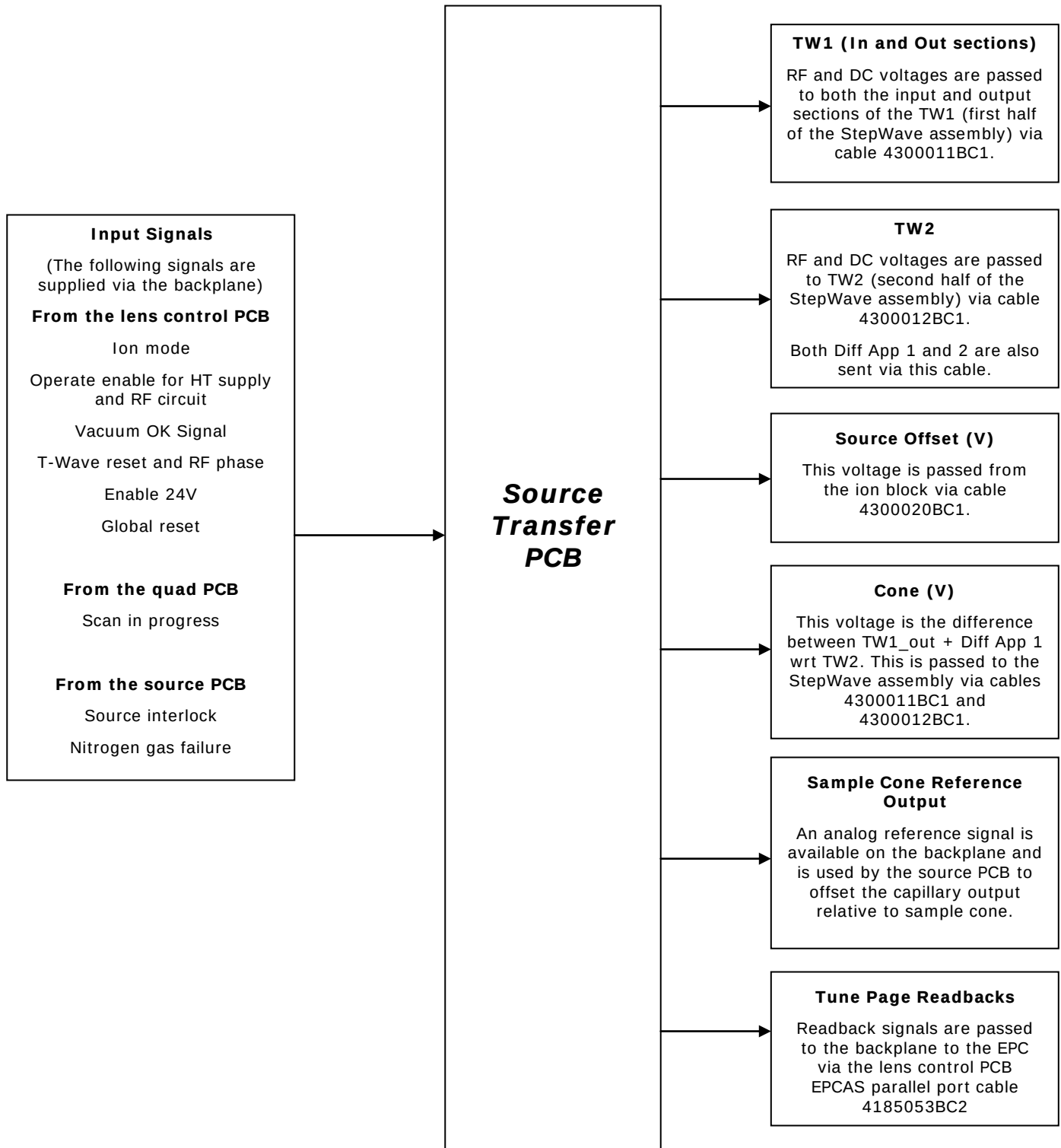


Figure 1 - Top internal view of the instrument

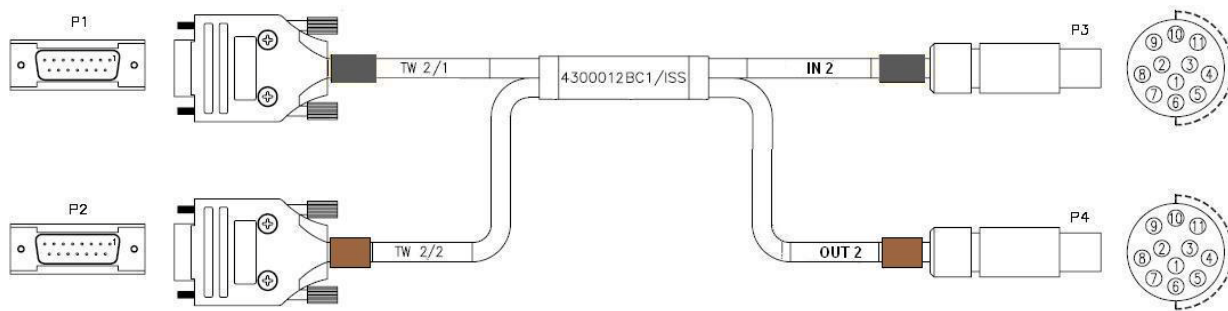
Inputs/outputs



Four cables (the source fragmentation cables) run between the source transfer PCB and the ion guide connection flange assembly. These cables are grouped into pairs and color-coded / labeled.

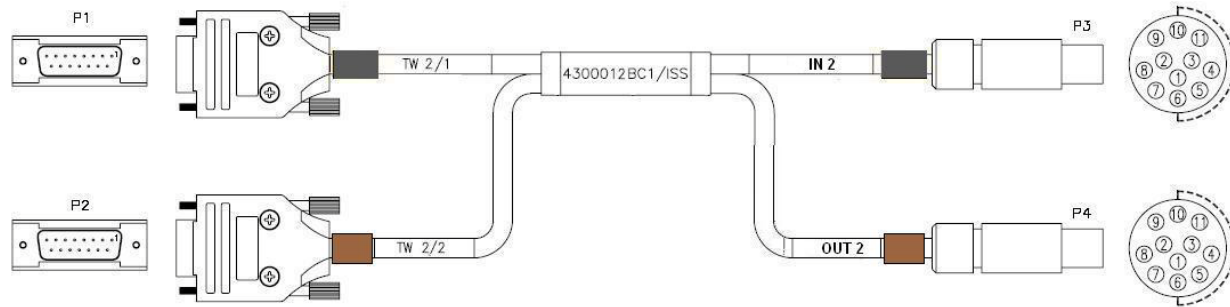
CAUTION: *Failure to attach the correct cable to the correct port on the ion guide connection flange assembly could cause a loss of beam. Refer to the relevant figure in the StepWave Assembly Technical Reference Sheet (p/n 715002815).*

Fragmentation output cable (TW1) 4300011BC1 (700005370) to ion guide connection flange then internal transfer cables 1 and 2 4300023BC1 / 4300024BC1



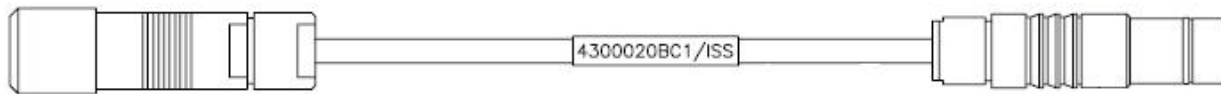
P1 / P2 15W D-type Pin No.	P3 / P4 Fischer Pin No.	Function	Pulse Level
8	11	OUTPUT0	TW1_In
9	1	OUTPUT1	
2	2	OUTPUT2	
10	3	OUTPUT3	
3	4	OUTPUT4	
11	5	OUTPUT5	TW1_Out
4	6	OUTPUT6	
12	7	OUTPUT7	
5	8	OUTPUT8	
13	9	OUTPUT9	
6	10	OUTPUT10	
Hood	Clamp	SCREEN	Screen

Fragmentation output cable (TW2) 4300012BC1 (700005371) to ion guide connection flange then internal transfer cables 3 and 4 4300025BC1 / 4300026BC1



P1 / P2 15W D-type Pin No.	P3 / P4 Fischer Pin No.	Function	Pulse Level / Description
8	11	OUTPUT0	Diff Ap 1
9	1	OUTPUT1	TW2
2	2	OUTPUT2	
10	3	OUTPUT3	
3	4	OUTPUT4	
11	5	OUTPUT5	
4	6	OUTPUT6	
12	7	OUTPUT7	
5	8	OUTPUT8	
13	9	OUTPUT9	
15	10	OUTPUT10	Diff Ap 2
Hood	Clamp	SCREEN	Screen

NOTE: For further information regarding the internal connections, see the StepWave Assembly Technical Reference Sheet (p/n 715002815).

Sample cone cable 4300020BC1 (700005375)

1W Fischer	1W Fischer Plug	Function
1	1	Source offset (V)
Hood	Hood	Ground

Diagnostic procedures

1. Click **View > System Diagnostics** on the Tune page.
2. Type **1147** as the password and press **Enter**.
3. Click the **StepWave Diagnostics** tab to view the StepWave diagnostic readbacks.

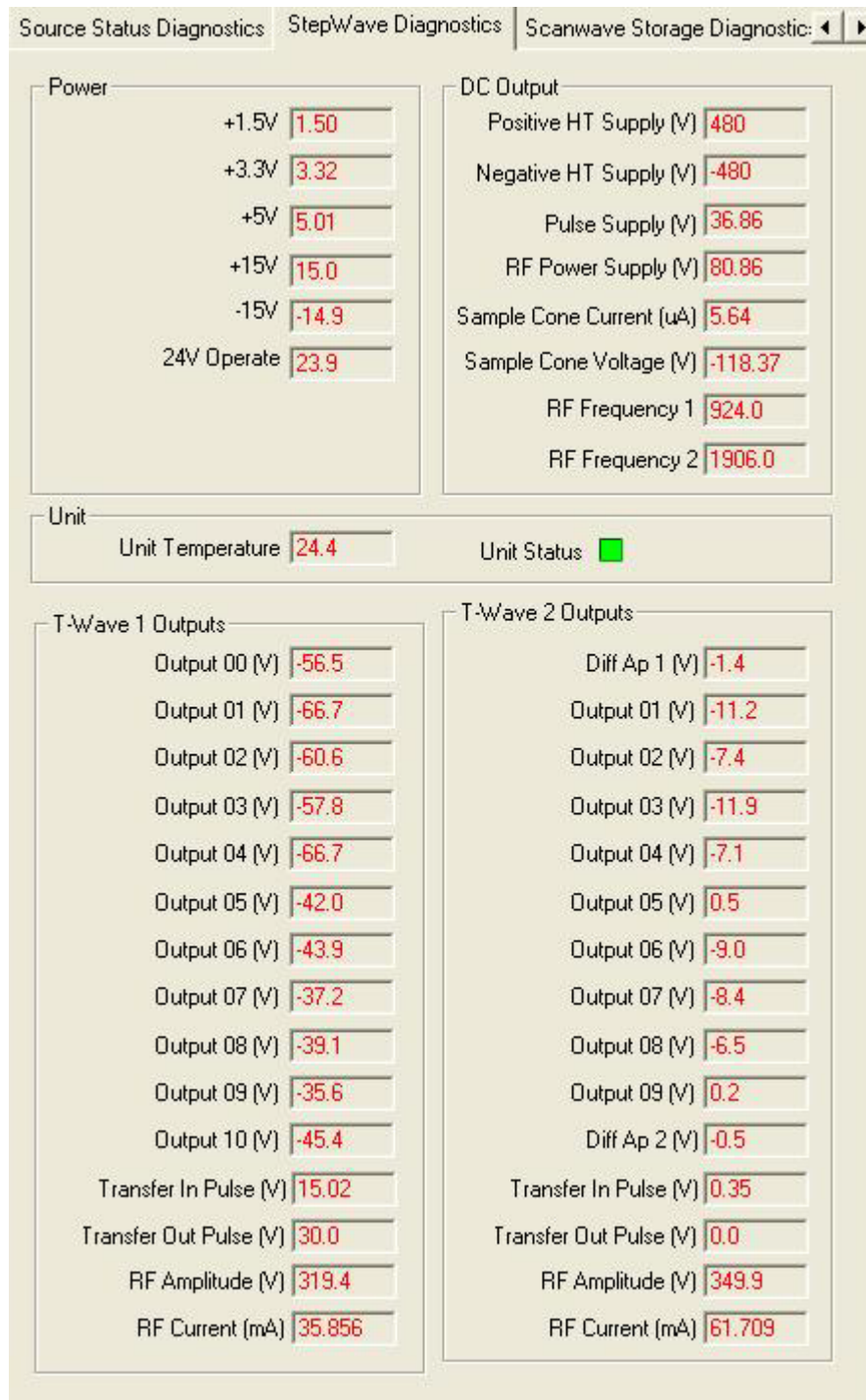


Figure 2 - StepWave Diagnostic tab

Power readbacks

The 24 V is an externally created voltage. It is generated on the power module PCB and sent to the source transfer via the turbo midplane PCB and the backplane PCB.

The 24 V is used to supply the following:

- Electronics LV supply
- RF and HT circuits
- Continuous 24 V power outlet
- Switched 24 V power outlet
- 80 V for the RF amplifier supply
- 42 V for the pulse voltage supply
- ± 480 V for the HT supply

All other voltages displayed in the power section are created on the PCB itself. A dual output DC-DC converter produces the ± 15 V. A second DC-DC converter produces the 3.3 V supply for the digital circuitry. A linear regulator creates 1.5 V from the 3.3 V.

DC output readbacks

Positive / negative HT supply (V)

These give the current status of the pulse amp high voltage supply. If no voltage is shown in Operate (and the other settings / parameters are satisfactory and there are no other instrument faults) the source transfer PCB may have failed and needed replacing.

Pulse supply (V)

This is a supply used for the T-Wave pulses. Since the max pulse amplitude is 30 V, the pulse amplifier requires this voltage as a minimum to supply the output.

RF power supply (V)

This is an 82 V power supply that is generated internally on the source transfer PCB.

Sample cone voltage (V) / current (μ A)

The source offset voltage is a DC offset between the ion block and TW1_In.

NOTE: *On older other instruments this potential was referred to as the sample cone voltage.*

The sample cone voltage on the Source tab is applied differently compared with other instruments. It is a DC offset between the TW1_Out (+ Diff app 1) and TW2. It is offset by a voltage ramp applied to the StepWave, which is dependent on the m/z of the ions transmitted through the first quadrupole. The StepWave voltage ramp is linear, starting at 5 V ($m/z = 2$) and increasing to a maximum of 25 V ($m/z = 1000$). Above m/z 1000 the StepWave voltage stays at 25 V, which means that the cone voltage readback may vary by 20 V, depending on the range of m/z ions selected on the Tune page.

NOTE: *The sample cone voltage is not physically applied to the sample cone aperture. It retains this name as it is still the key tunable parameter that has most affect on in-source fragmentation.*

If the sample cone current is very high, there could be breakdown between the ion block and TW1 on the StepWave.

More detailed Information regarding TW1 and TW2 can be found in the "T-Wave 1/2 outputs" section.

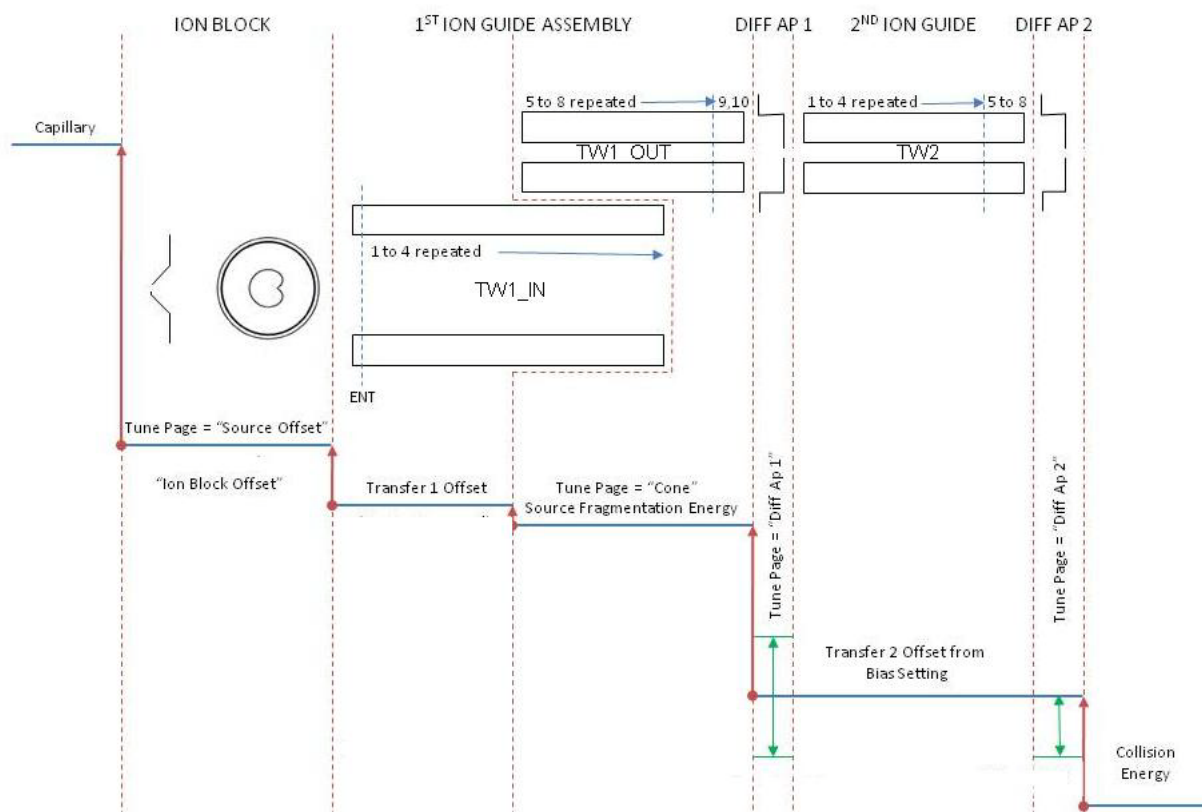


Figure 3 - StepWave bias level diagram

RF frequency 1 / 2

These are the respective T-Wave frequencies for TW1 and TW2. These frequencies are normally around 900 (TW1) and 1900 (TW2).

If they are much lower, there may be a short to the fragmentation output cable or the StepWave assembly.

If these values are much higher, this may indicate a disconnection in one of the following places:

- In the cables
- Between the ion guide connection flange assembly and the StepWave assembly
- Within the StepWave assembly itself

Unit readbacks

Temperature

This is a temperate readback of the source transfer PCB.

The temperature sensor is located near the digital control circuits on the PCB.

The normal operating temperature for this board should be approximately 10 °C above atmospheric temperature. If it is much higher, check the instrument fans are working correctly.

Status

This indicates if the PCB is operating correctly (green) or has an internal fault (red).

T-Wave 1/2 outputs

The Stepwave assembly has two main sections, T-Wave 1 (TW1) and T-Wave 2 (TW2).

TW1 also has two sections, TW1_in and TW1_out.

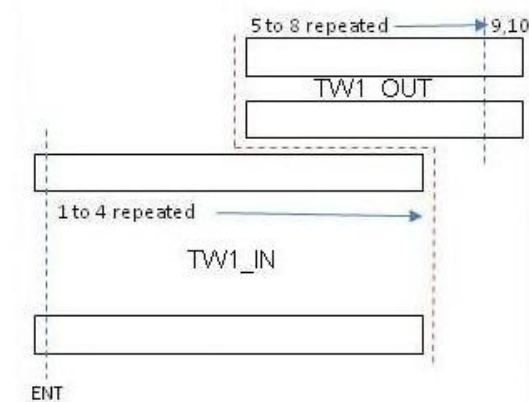


Figure 4 - TW1_in and TW1_out

T-Wave Channel	Pulse Level	
	TW1	TW2
0	TW1_In	Diff App 1
1		TW2
2		
3		
4		
5	TW1_Out	
6		
7		
8		
9		
10	Diff App 2	

RF current (mA)

This is the current drawn by the RF supply. Both TW1 and TW2 RF currents are dependent upon the current RF amplitude. TW1 is normally lower than TW2 due to difference in output frequencies.

T-Wave 1 output

The output readback in this section are not split into TW1_in or TW1_out. However, it is possible to see the difference in DC voltage applied.

In Figure 2 outputs 00 to 04 are (on average) higher than outputs 05 to 10. This is also seen in the Transfer In Pulse (V) and Transfer Out Pulse (V) readbacks.

This potential difference (~ 10 V) between the input and output sections of TW1 causes the charged ions to migrate from the body section of the StepWave assembly into the head section. The neutral particles continue down the axis of the body section and are pumped away helping to reduce the chemical noise.

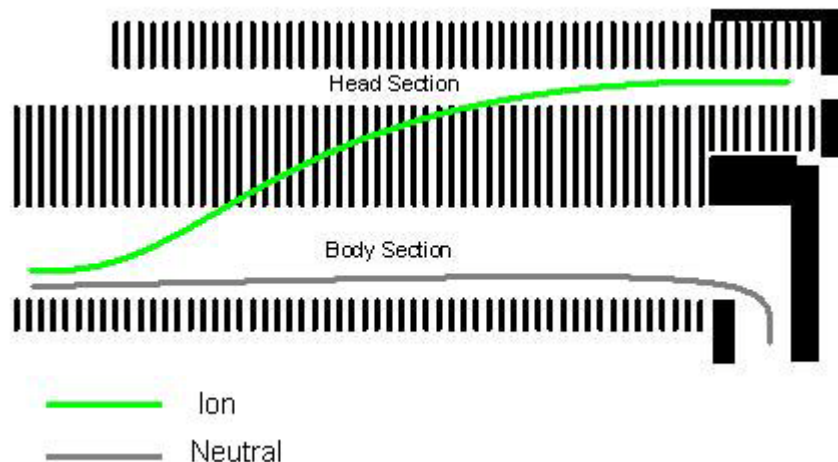


Figure 5 - Migration of ions from the body to the head section

RF amplitude

This value is mass dependent but is not controlled directly by the mass program. The displayed value is set by the RF settings shown in Figure 6 and Figure 7. The RF ramp is generated on the enhanced source transfer PCB and synchronized by the “scan in progress” signal which is one of the digital inputs received by the PCB from the backplane.

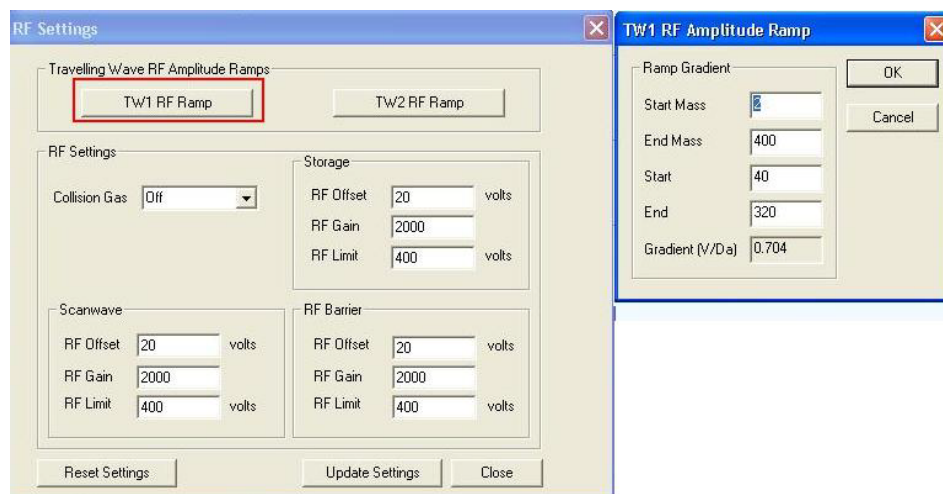


Figure 6 - RF setting window (TW1 RF ramp)

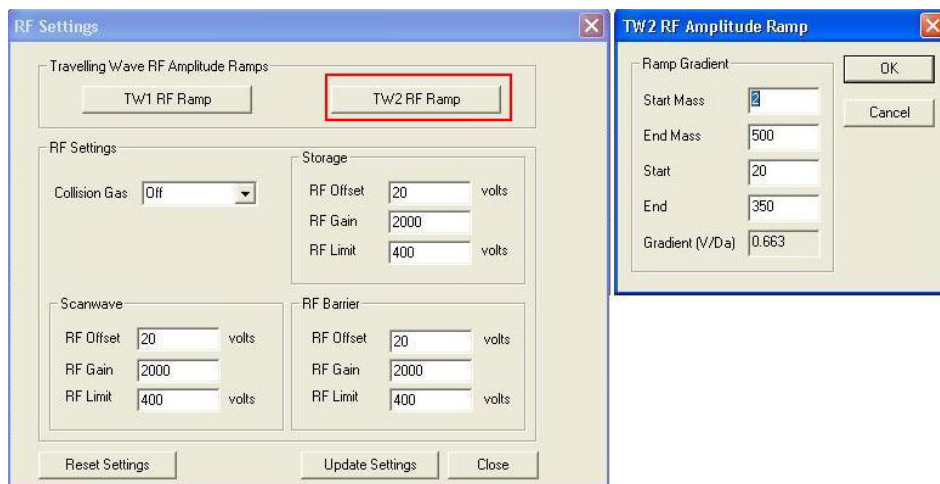


Figure 7 - RF setting window (TW2 RF ramp)

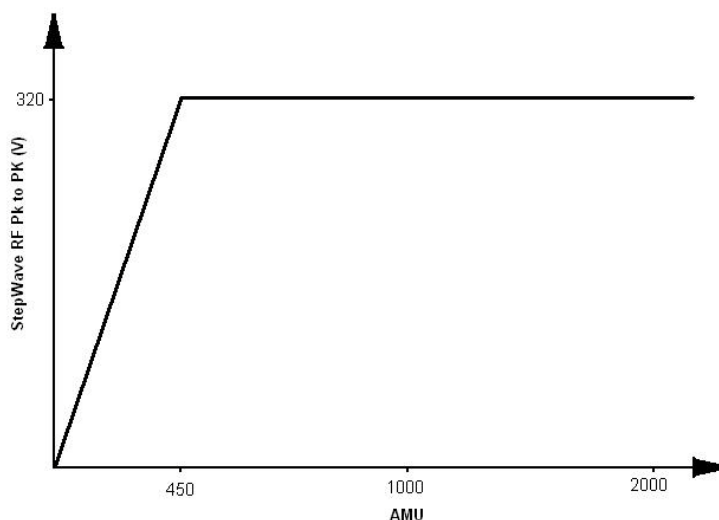


Figure 8 - StepWave RF peak-to-peak voltages for MS and MSMS

CAUTION: *These settings must not be adjusted as they may affect the performance of the instrument. They must only be used as a reference.*

T-Wave 2 output

The T-Wave 2 output readbacks are the same as T-Wave 1. The only difference is the addition of Diff Ap 1 (V) and Diff Ap 2 (V).

Diff Ap 1/2 (V) readbacks

These are readbacks of the voltages supplied to differential aperture 1 and 2. These values are set by the Diff aperture One (V) and Diff aperture Two (V) sliders on the Advanced tab in the Tune page.

Diff Ap 1 and 2 are provided by T-Wave channel 0 and 10 respectively.

Other relevant information

Removing the source transfer PCB

CAUTION: *The source transfer PCB may be damaged by static discharge. Ensure that suitable antistatic precautions are used at all times.*

1. Close the Tune page.
2. Switch into pump override.

CAUTION: *The Xevo TQ-S must not be left in pump override for extended periods of time. Pump override must only be used when the electronics are required to be turned off.*

3. Switch off the electronics.
4. Remove the top and left-hand side instrument covers.
5. Remove the following connectors from the top of the source transfer PCB:
 - TW1 OUT1
 - TW1 OUT2
 - TW2 OUT1
 - TW2 OUT2
 - Sample cone
6. Press the two securing clips at the side of the boards outwards and remove the board.

Reinstalling the source transfer PCB

1. Slide the PCB into the slot in the electronics enclosure.
2. Ensure the PCB is flush with the other PCBs in the enclosure and close the securing clips.
3. Reconnect the following connectors to the top of the source transfer PCB:
 - TW1 OUT1
 - TW1 OUT2
 - TW2 OUT1
 - TW2 OUT2
 - Sample cone
4. Switch on the electronics, wait for the boot-up sequence to complete, then switch the pump override to Auto.

CAUTION: *After replacing a PCB, ensure the Tune page readbacks are correct for the relevant board.*