

Technical Service Bulletin 030633
ADAPT Frequency Adjustment

This service bulletin provides a pilot frequency measurement and adjustment procedure for those transmitters utilizing the Comark ADAPT ATSC television exciter.

Legal requirements dictate that the ATSC pilot frequency be measured and maintained within a certain tolerance window: +/-3 Hz for stations employing an N+1 precise frequency offset or +/- 1000 Hz otherwise. The determination as to whether a pilot offset is required for a particular channel may be made by consulting the FCC or original station license.

The ATSC pilot frequency measurement is made with a vector signal analyzer locked to a precise 10MHz source. A traditional frequency counter can not be used for this measurement.

The ATSC pilot frequency in the ADAPT exciter depends on two factors: the upconversion local oscillator frequency generated in the synthesizer module and the bit rate of the incoming SMPTE 310 data stream. Whenever gross errors in channel frequency are detected, these two sources should be checked for correct operation. The incoming SMPTE 310 bit rate may be checked with a MPEG stream analyzer, such as the Thomson Granite or Mercury, and should be 19.39265846 Ms/s. The local oscillator frequency may be checked with a frequency counter and should correspond to the exact center channel frequency (e.g. 593.000000 MHz for channel 34 @ 590 - 596MHz).

Assuming that these two sources are adjusted to the correct values (within the tolerance of measurement), the final ATSC pilot frequency may be “nudged” by slightly adjusting the LO frequency from its nominal value. This adjustment is performed via a front panel potentiometer, in the case of a free-running synthesizer module, or via the adjustment of the external 10 MHz source, in the case of a synthesizer module locked to an external reference. If this adjustment is not sufficient, the stored synthesizer frequency setting may be changed via the PCL control screen for Optimum and Ultimate transmitters. *For Advantage, Affinity, DCX, DCX Millennium, and DCX Paragon transmitters, the synthesizer must be returned to Comark for service.*

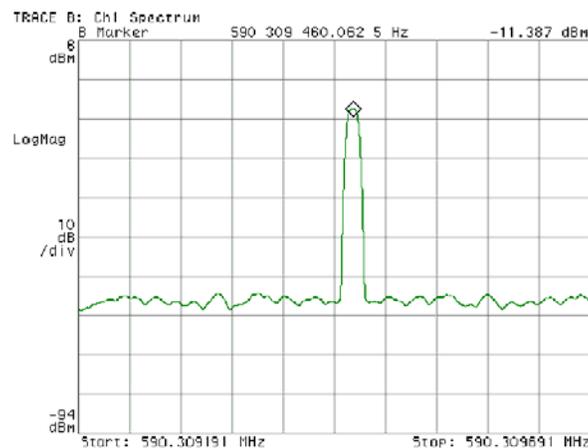
Procedure 030633: ADAPT Frequency Adjust Procedure	
Applicability	All transmitters utilizing ADAPT ATSC exciter.
Prerequisites	None.
Equipment Required	Vector signal analyzer (HP 89441V or equivalent) or possibly high-quality spectrum analyzer, SMPTE stream analyzer (Thomson Granite or equivalent), Precise 10 MHz frequency reference (N+1 offset), 50 ohm BNC coaxial cable. BNC RF attenuators
Comments	Procedure for minor adjustments of ATSC pilot frequency.

1. Set vector signal analyzer to “spectrum analyzer” mode.
2. Connect vector signal analyzer to precision 10 MHz frequency reference if N+1 precision offset is required. Otherwise, internal analyzer frequency reference is sufficient, and no external PFC source is required.
3. Allow analyzer temperature to stabilize for thirty minutes.

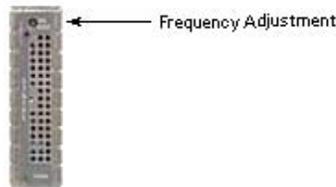
4. Connect coaxial cable from BNC sample port on exciter preamplifier module to vector signal analyzer. Add RF attenuators and adjust input level as necessary to avoid INPUT OVD (overload) warning messages.
5. Tune analyzer to desired DTV channel pilot frequency. Confirm presence of DTV signal and ATSC pilot on analyzer screen.

NOTE: The ATSC pilot frequency is nominally 309,441 Hz above the lower channel edge (e.g. 593.309441 MHz for channel 34 @ 590 - 596MHz).

6. Adjust analyzer frequency span to 500 Hz, and change resolution bandwidth as necessary, to place ATSC pilot prominently in center of screen. See image below.



7. Activate frequency markers on vector signal analyzer and use “marker-to-peak” function (where available) to place a marker directly atop the ATSC pilot.
8. Allow measurement to stabilize for five minutes.
9. Read ATSC pilot frequency from marker frequency display. If ATSC pilot frequency is within tolerance, procedure is complete. Otherwise, proceed to next step.
10. Connect sample of incoming SMPTE data stream to SMPTE stream analyzer.
11. Verify that SMPTE bit rate is 19.39265846 MBit/sec. If clock rate is not correct, adjust clock settings upstream in MPEG processing equipment, such as Thomson Turquoise or Amber, and repeat ATSC pilot frequency measurement above.
12. If SMPTE bit rate is correct, proceed to adjust exciter LO frequency via one of following two methods:
 - a. Fine frequency adjustment potentiometer on front of exciter synthesizer module, in the case of a free running synthesizer module.
 - b. Fine frequency adjustment of external 10 MHz source, in the case of a synthesizer module locked to an external reference.

**Synthesizer module**

13. If adjustment range above is insufficient, internal frequency setting of synthesizer module may be changed. Setting is stored in non-volatile memory inside synthesizer module and may be changed via PCL control screen for Optimum and Ultimate transmitters. *For Advantage, Affinity, DCX, DCX Millennium, and DCX Paragon transmitters, the synthesizer must be returned to Comark for service.*
14. Optimum and Ultimate:
- Navigate to CONTROL LEVEL 3 screen on PCL touch screen.
 - Use (+) and (-) buttons to slightly change center channel frequency from nominal value.
 - Measure resulting ATSC pilot frequency.
 - Modify frequency setting as necessary until correct ATSC pilot frequency is obtained.

NOTE: The set_synthe command used whenever a DAP module is installed/replaced is not the same setting referenced here. The set_synthe setting is the OLDC frequency for those exciters equipped with the OLDC module. Changing the set_synthe setting does not change the internal frequency setting of the synthesizer module (i.e. does not change ATSC pilot frequency). However, the set_sythe setting must match the internal synthesizer setting for the OLDC module to be recognized and operate properly.

15. Procedure complete.

At Comark, we are constantly striving to improve the satisfaction of both our new and existing customers. Please do not hesitate to contact Comark Customer Service with any questions you may have concerning the contents of this service bulletin.

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