

## 10.0 Using Multiplex

### 10.1 Stereo Generator Option

Although the stereo generator is a field installable option, we recommend ordering it factory installed. This allows us to perform a thorough calibration of the unit for you. However, should you insist on doing it yourself, you can rest assured it will perform well as long as you correctly follow the installation procedure. Field installed stereo generator options are shipped with installation instructions which you should later insert in this manual, preferably at the end of the present section.

The FM Pro stereo generator is similar to the PPDM circuit used in the world renowned Aphex Digicoder. PPDM (parallel path digital modulation) technology is an Aphex exclusive patented method of generating a perfect stereo multiplex signal. You may refer to Appendix 1, "Stereo Generator Theory With PPDM Explained" for detailed information on PPDM and general stereo generator information.

### 10.2 The Stereo Generator Menus

From the Main menu, go to the Processing menu. On page 2 of the Processing menu select F6, "Stereo Gen.". There are two stereo generator menu pages. Page 1 gives you the pilot settings and page 2 gives you the mode options. These two pages are shown below.

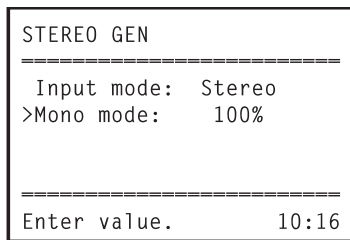
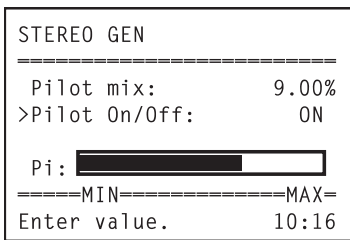


Figure 10-1  
Stereo Generator Menus

### 10.3 Presets Memory

The mode and pilot injection level is saved in the user preset memory whenever a preset is saved.

### 10.4 Mode Settings

Stereo generator modes are saved in the user presets. You can therefore save presets for stereo and mono operation, and run them as day parting events if you wish. When starting the FM Pro for the first time, you should set the stereo generator and save to the global preset U01 so the factory presets may inherit the mode and thus work

properly in your system. Refer to section 7.

#### 10.4.1 Mono Modes

Great flexibility is afforded the user by providing three mono modes: Mono-L, Mono-R, and Mono-L+R. You can also decide if the mono mode should remain at 90% peak modulation as for the stereo mode, or be expanded to use the full 100% peak modulation limits. Normally you will want the Mono-100% mode, and indeed most other stereo generators provide only this mono mode.

Occasionally we encounter broadcasters who switch from stereo to mono simply for the purpose of inserting an additional subcarrier signal for a certain period during the day. In this case it is necessary to limit the mono modulation to 90%. In effect, the 9% pilot injection is being replaced by the additional subcarrier. For those broadcasters who need it, we provide the Mono-90% mode of operation. Just another thoughtful service of Aphex technology and design.

#### 10.4.2 Stereo Mode

In the stereo mode, the peak modulation of left and right channels hits 90% modulation while the pilot is customarily adjusted by the user to equal 9% modulation. This condition will be restored whenever stereo mode is selected regardless of which mono mode may have been in use.

### 10.5 Pilot Function

The pilot signal is automatically switched off when any mono mode is selected, and on when the stereo mode is selected. Once you are in the stereo or mono mode you can switch the pilot on and off for testing or other purposes. For example, you can switch on the pilot while in a mono mode, and switch off the pilot while in the stereo mode. Regardless of the state of the pilot in any mode, it will automatically be returned to the normal state when another mode is selected. The user may adjust the pilot injection from approximately 7%

to approximately 11% modulation. The typical setting is 9% modulation. Though probably not good practice, you can create different pilot injection levels in different user presets if you wish.

### 10.6 Multiplex Output

The stereo multiplex output level is adjusted by a rear panel multiturn precision trimmer. The level is adjustable from zero to approximately 7 volts peak (14Vp-p) at 100% modulation. The output impedance of the BNC jack is approximately 10 ohms sourced by a high current video output driver circuit to maintain extremely fast slew rate and a strong drive capability. This will reliably drive up to 100 feet of low capacitance coaxial cable, either terminated or unterminated.

### 10.7 Multiplex Cable Connections

Many stereo generators suffer from the effects of output cable capacitance, and their manufacturers tell you to keep the output cable under 6 feet long. The FM pro can drive much longer cables without a problem either of distortion or stereo separation. You can use either 50 or 75 ohm coax line without any noticeable difference in performance. We have found no reason to terminate the line in practice since the bandwidth of the multiplex signal does not reach a high enough frequency to excite the transmission line characteristics of a typical cable. You may, however, use a line terminator if you wish. It is best to use low capacitance coaxial cable, especially for runs over 20 feet long.

### 10.8 Modulation Overshoot Problems

Once you have adjusted the multiplex output level to satisfy proper total peak modulation limits of your transmitter, the pilot injection indicated on your modulation monitor may be significantly lower than the indication on the Stereo Generator menu. If this occurs, then you are experiencing a transmission problem between the FM Pro and your FM exciter, or with the FM exciter itself.

#### 10.8.1 STL Problems

Any filters or amplifiers in the path from the FM Pro's stereo multiplex output to the FM Exciter input will probably introduce modulation overshoot. A composite STL typically introduces such overshoot, although newer types are available which almost eliminate the problem. It cannot be over-emphasized how important the STL can be to your on-air sound and loudness.

One way you can test your STL is with a square-wave generator and oscilloscope. Feed the tone into the STL transmitter at around 20% modulation and observe the receiver's output on the scope. Of course, this can most easily be done with the transmitter and receiver on the same workbench, but you can also check an installation by having workers at each end of the link. First use a square-wave frequency of 50Hz. The output wave should be nearly rectangular with less than 3% trapezoidal tilt. This test reveals the typical limitation of most STL's which is an inadequate phase lock loop filter in the FM modulator. Next, sweep the squarewave frequency upwards through 20KHz. There should be no tilting or ringing visible on the output. Unfortunately, there is little you can do if your STL does not pass muster except to purchase a better set of STL equipment.

#### 10.8.2 FM Exciter Problems

Older FM exciters (and many newer types, especially units used in Europe and the far east) produce modulation overshoot as a result of inadequate low frequency response. Highly processed audio containing heavy bass frequencies will cause the exciter to overmodulate.

You can investigate your FM exciter using the squarewave technique. For this you need an FM demodulator with d.c. response. Typical FM monitors are not adequate in that regard. Our experience has shown you cannot trust even the very expensive European FM modulation analyzers for this test. One fairly reliable method is to use a common old fashioned FM receiver with the AFC defeated. You can look at the FM detector's output with a d.c. coupled scope probe (prior to the stereo decoder) to see a good demodulated replica of the FM. An FM exciter should be capable of modulating a 50Hz squarewave with less than 3% trapezoidal tilt. Unfortunately there is little you can do besides purchase a better FM exciter should your exciter not pass the test.

#### 10.8.3 Composite Clippers

If your system has overshoot caused by the STL, but not the FM exciter, then you may be able to mitigate the problem by using a composite clipper on the STL composite output. We highly recommend avoiding composite clippers whenever possible, but to compensate for a bad STL we would relent. The use of composite clipping will introduce additional distortion to the sound and

generate spurious frequencies which will fall into the subcarrier frequency band. The result can be to create a synthetic multipath distortion effect which will reduce your effective broadcast coverage area. Please do not use a composite clipper beyond the minimum clipping needed to compensate for STL overshoot. The FM Pro is designed to create high on-air loudness without composite clipping.

#### **10.9 Using RDS Encoders**

The FM Pro does not directly support an RDS encoder interface. If you intend to use an RDS encoder, you can insert it as an inline device or you can let it lock up to the multiplex pilot and inject its RDS subcarrier into one of your FM exciter auxiliary inputs.

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