as they usually have a low inductance to reduce the required bias voltage, and to ease the high frequency equalization problems.

Measurement of Resonant Frequency. The method described below will allow the resonant frequency of the playback head to be measured very simply while it is installed on the tape transport and connected to its preamplifier. Procedure is as follows:

1. Connect an R.F. choke (100 uHy to 1 mHy) to an audio oscillator, and hold the choke against the pole of the head, with the axis of the choke parallel to the direction of tape travel.
2. Adjust the oscillator output to give a reading on a voltmeter connected to the output of the playback amplifier. Keep the level low enough to avoid amplifier saturation.
3. Sweep the oscillator upward in frequency until the output signal goes thru a peak and then falls off. The peak frequency is resonance.

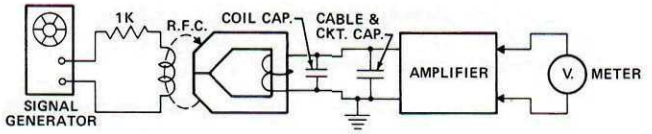

Fig. 6

4. If the peak reading occurs below the maximum operating frequency, change to a play head with lower inductance. Cable capacitance can sometimes be lowered to achieve small changes in resonant frequency.

6. CROSSTALK REJECTION

Crosstalk is the interchannel coupling between adjacent channels of a multichannel tape system. There are several types of Crosstalk:

1. **Transformer Crosstalk.** The figure given in the head specifications is usually called "Transformer Crosstalk Rejection", and is measured at 1 kHz by applying 1.0 volt rms to one coil of the head and measuring the signal picked up by the other coil. Typical rejection ratios run between 50 dB and 60 dB and they will vary somewhat with frequency. Care should be taken to place an electrostatic shield between the terminals and cables at high frequencies during measurements to prevent erroneous poor readings.

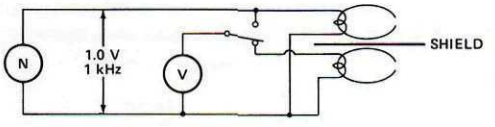

Fig. 7

2. **Record Crosstalk** is the signal recorded by an inactive channel of the record head when the adjacent channel is recording. To check for this, make a saturation level recording on one channel while only bias is being applied to the inactive channel. (Lack of bias will reduce record sensitivity and effectively eliminate the crosstalk.) Playback with a monophonic (single-channel) head on the active and inactive tracks and compare the two signals.
3. **Playback Crosstalk** can be checked by recording a saturation level signal on one channel only, with bias disconnected from the other (inactive) channel. Take playback readings on two channels of the multi-channel play head, and the ratio of active to inactive readings is the Playback Crosstalk Rejection. The input loading on the active track will affect the reading on the inactive track, with maximum reading from a shorted coil and minimum from an open active coil; circulating current in active coil induces additional crosstalk signal in other coil.
4. **Adjacent Channel Crosstalk.** This is a signal picked up directly from a recorded track on the tape by a closely spaced adjacent head channel. It can become troublesome with low-frequency long wavelength signals on stereo or quad systems which have only 12-mils spacing between recorded tracks. Tight-fitting windows in the face shields surrounding the playback head poles keep this crosstalk to an acceptable level.

NOTE: Transformer Crosstalk gives a figure which is very close to the combined worst-state condition of Record and Playback crosstalk. For this reason it is the most commonly used.

7. COIL PHASING AND POLARITY

The coils of record, play, and erase heads are consistently wired to produce a predictable **phase** relationship (A.C. excitation) or **polarity** (D.C. excitation.) For example, the coils of a multichannel head are wired so they produce in-phase magnetic fields on the face poles when the coils are connected in parallel and excited from an A.C. source.

A.C. Phase Check. It is possible to verify the relative phasing of the coils on a multi-channel head by exciting the head pole faces with coil and observing the Lissajous pattern from the exciting and picked up voltages as displayed on an oscilloscope. A reversed coil will flip the pattern 90 degrees. This method does not work well with double-gap erase heads or for specifying absolute phasing between various heads (see Fig. 8).

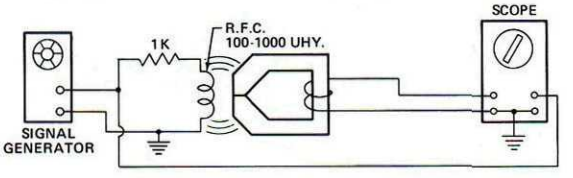

Fig. 8

D.C. Polarity Check. A more versatile test or specification is to apply a D.C. current to the head coil and note the North and South poles on the head face poles, using a magnetic compass. Procedure is as follows:

1. Remove the case from compass needle and cut the dial

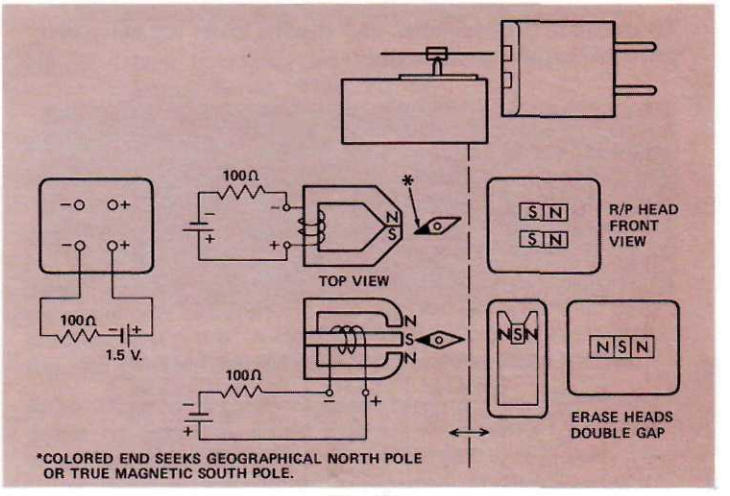

Fig. 9