voltmeter (or other line output operating level selected by the user).

14. Remove power and set peak/vu meter switch S3 (Figure 5-10) to desired operation position, peak or vu. Reapply power.

15. Adjust meter calibration potentiometer R21 (Figure 5-10) for indication of -6 dB (meter switch S3 in peak position) or 0 vu (meter switch S3 in vu position).

16. Repeat procedure for the other audio channels.

17. With power off, remove input/output module and extender board from input/output mainframe. Reinstall input/output module into mainframe.

18. Remove extender board from electronics assembly and reinstall audio PWAs removed in step 1.

5-35. Recorder/Reproducer Audio Signal System Alignment

NOTE

The input/output assembly should be adjusted prior to performing the recorder/reproducer alignment. All recorder/reproducer alignment procedures are to be performed with the record manual/preset switch on the input/output assembly set to the preset position.

The recorder/reproducer alignment procedure must be performed prior to the record alignment procedure. Reproduce alignment consists of setting low and high frequency equalization of each channel, adjusting reproduce head azimuth and phasing (multichannel systems), and setting operating level of each channel. Record alignment consists of setting bias level, setting record high frequency equalization, and setting system output level.

The alignment procedures are presented step-by-step in serial form for reproduce and record alignment of each channel. For the alignment of 2 or 4-channel systems, and after the reader has become familiar with the procedures, it may be more convenient to perform the steps in parallel for each channel.

The basic recorder/reproducer input and output level is set to -5 dBm, regardless of the actual operating level flux level selected for use. For maximum performance, the use of Ampex 456 tape with an operating level of 370 nWb/m is recommended. (This level is 6 dB higher than the 185-nWb/m reference level on Ampex Standard Alignment Tapes.) Procedures are included in this manual for setting the operating level to 185 nWb/m, 260 nWb/m, and 370 nWb/m.

When the basic recorder/reproducer is correctly adjusted, the Ampex input/output assembly or any input/output assembly (either one correctly adjusted) can be used with the recorder/reproducer without any adjustment.

NOTE

All voltage levels are expressed in dB referenced to 0.775 volt rms across 600 ohms. Therefore a level of zero dBm corresponds to 0.775 volt rms.

5-36. Use of Alignment Tapes — General Discussion. The alignment tapes have been precisely recorded and must be correctly handled and stored to retain their accuracy. The following requirements should be especially followed.

1. Clean and demagnetize the heads and other tape-handling components before using the test tape.

2. Never store test tapes in areas where there are temperature or humidity extremes or where magnetic fields may be present.

3. Remove test tapes from equipment only after a normal play or spool mode run (never after a fast-winding mode).

The test tape is threaded on the recorder/reproducer in the normal tape path (from the supply to the takeup reel). During alignment procedures, the rewind and fast forward modes may be used as necessary. After alignment, wind the tape

completely on the takeup reel and then place the recorder/reproducer in the rewind spool mode to wind the tape back on its original reel. Note that after extensive use, high frequency tones on the alignment tape may drop as much as 2 dB, particularly at the slower tape speeds.

Operating level and reproduce frequency response can be checked with a standard alignment tape (Table 5-1). When using a standard alignment tape that is recorded the full width of the tape to check a system with heads less than full width, the response readings below approximately 10.0 kHz become progressively invalid as the frequency decreases. This is caused by the low-frequency fringing effect of the reproduce head. The reproduce head picks up additional flux beyond the track width of the head as the frequency decreases. This error, being wavelength dependent, becomes worse as the wavelength increases.

Therefore, if the equalization is correctly adjusted, the reproduce response when using a full-track alignment tape on either a 2-track, 1/4-inch tape system or a 4-track, 1/2-inch tape system should conform to the relative curves shown in Figure 5-11 within the tolerances given in Table 5-3. The curves given in Figure 5-11 display the *relative* fringing frequency response and *do not* include the fixed error due to the wider reproduce core width (as compared to the record head width).

Table 5-4 provides the amplitude correction factors to be used when setting operating level using a full-track alignment tape on a 2-track, 1/4-inch tape system or a 4-track, 1/2-inch tape system.

The correction factors in Table 5-4 are the amounts by which the actual measured reproduce output from a full width alignment tape will exceed the reproduce output of the correct track width recorded to the same fluxivity. The table includes the fixed error due to the wider reproduce core width and the relative fringing error (shown in Figure 5-11) for frequencies of 500 Hz, 700 Hz, and 1.0 kHz. For example, when reproducing the 700-Hz, 185 nWb/m tone on an Ampex 15 in/s full-width alignment tape on a 2-track, 1/4-inch tape system, the output (as read on an ac voltmeter) will be +1.14 dB higher (Table 5-4) as compared to reproducing and alignment tape that has the same track format as the recorder/reproducer.

The amplitude correction factor of 1.14 dB was obtained by adding the following figures:

0.56 dB - compensation for wide reproduce core width (see asterisk, Table 5-4).

0.58 dB – relative fringing frequency response due to fringing error effect at 700 Hz and 15 in/s (Figure 5-11).

1.14 dB – amplitude correction factor.

Note that if the alignment tape used matches the head track format, the correction factors given in Table 5-4 are not used. Also no corrections are required when using a full-width alignment tape to align a full-track head assembly system.

Another source of error is the reproduce head pole contour effect. This effect is prevelent when using the low-frequency sections of the alignment tape. If the alignment tape track format matches the reproduce head format, the error is not severe. This type of error can be minimized by adjustment of the low frequency reproduce equalizers while performing the overall record/reproduce alignment procedure.

5-37. Using a Flux Loop – General Discussion. An accurate method of setting equalization involves the use of a flux loop driven by an audio oscillator in order to induce an electromagnetic field into the reproduce head. The field produced by the flux loop may be equalized to simulate the short circuit flux/frequency response from an ideally recorded alignment tape. The response of a correctly equalized reproduce system to a correctly equalized flux loop will be an almost constant output with frequency over the audio range of interest. However, the use of the flux loop will not disclose the following errors:

- Reproduce head low frequency pole contour and secondary gap effect.
- Reproduce head high frequency gap loss.

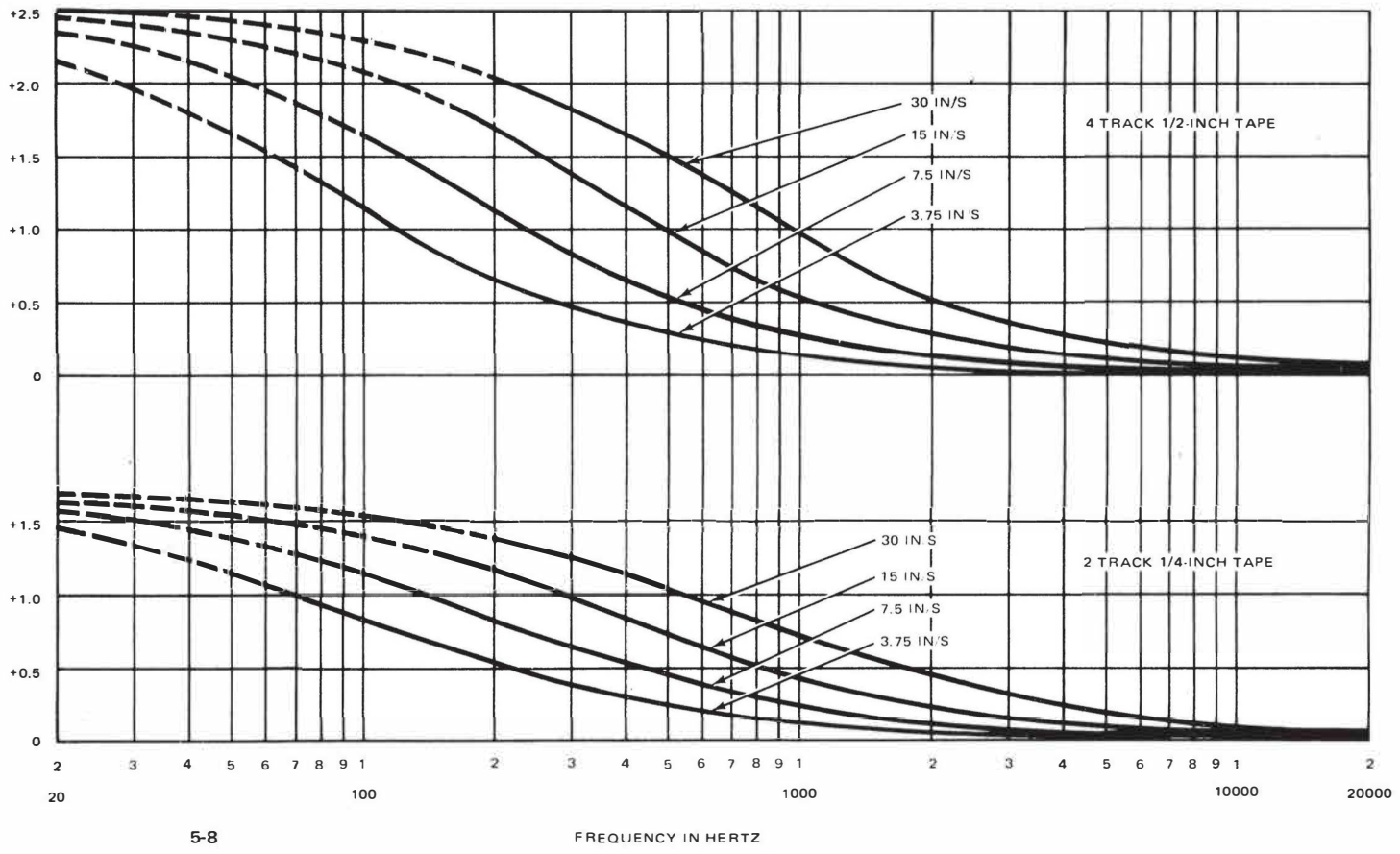

Figure 5-11. Relative Fringing Frequency Response Due to Fringing Effect

Table 5-3. Reproduce Frequency Response Tolerances

SPEED	TOLERANCE ±0.5 dB	TOLERANCE ±1.5 dB	SEL SYNC ±2.0 dB
30 in/s	250 Hz – 20 kHz	35 Hz – 250 Hz 20 kHz – 28 kHz	50 Hz – 15 kHz
15 in/s	125 Hz – 15 kHz	20 Hz – 125 Hz 15 kHz – 20 kHz	40 Hz – 12 kHz
7.5 in/s	125 Hz – 10 kHz	30 Hz – 125 Hz 10 kHz – 15 kHz	–
3.75 in/s	125 Hz – 5 kHz	30 Hz – 125 Hz 5 kHz – 10 kHz	–

NOTE: To the above tolerances, add manufacturing tolerances of the alignment tape and relative fringing frequency response due to fringing effect (Figure 5-8).

Table 5-4. Amplitude Correction Factors for Setting Operating Level when using Full-Track Alignment Tapes on 2-Track or 4-Track Systems

SPEED	REFERENCE FREQUENCY	CORRECTION FACTOR*	
		2 TRACK	4 TRACK
30 in/s	500 Hz	+1.61 dB	+2.10 dB
	700 Hz	+1.46 dB	+1.85 dB
	1.0 kHz	+1.29 dB	+1.58 dB
15 in/s	500 Hz	+1.29 dB	+1.58 dB
	700 Hz	+1.14 dB	+1.34 dB
	1.0 kHz	+1.01 dB	+1.13 dB
7.5 in/s	500 Hz	+1.01 dB	+1.13 dB
	700 Hz	+0.90 dB	+0.99 dB
	1.0 kHz	+0.81 dB	+0.87 dB
3.75 in/s	500 Hz	+0.81 dB	+0.87 dB
	700 Hz	+0.74 dB	+0.79 dB
	1.0 kHz	+0.69 dB	+0.74 dB

*The amplitude correction factors shown in the table are the sum of the values shown in Figures 5-11 for the frequencies shown in the table, and the fixed errors due to wider reproduce core width as follows:

2 track – 0.56 dB due to 80-mil reproduce core on 75-mil track
4 track – 0.6 dB due to 75-mil reproduce core on 70-mil track