DEVELOPMENT STANDARD

QIC-151
Revision B
15 Jun 94

MAGNETIC HEAD FOR USE WITH
QIC-3050-MC RECORDING FORMAT

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QIC DEVELOPMENT STANDARDS

REVISION HISTORY

QIC-151

Revision Level	Detail	Revision Date
Revision B	Add Details on Write Equalization Scheme	6/15/94

This document defines those parameters standardized on the magnetic tape head utilized in the QIC-3050-MC minicartridge tape drive.

This head is a read-while-write element in serpentine mode.

It is designed for use with a 900 Oe DC 2750 or equivalent cartridges at packing densities up to 38,750 FTPI, with 40 tracks on the tape through physical displacement of the head.

1.0 MECHANICAL REQUIREMENTS

1.1 The magnetic head is of a read-while-write bi-directional con-figuration and is to be used on a 1/4" minicartridge with 900 OE magnetic media. No erase gap is used, so the write gap must over-write previously recorded data.

1.2 Physical dimensions and track layout are detailed in Figure 1.

1.3 Read effective track width is .0035"+/- 250 u".

1.4 Write effective track width is .0060"+/- 250 u".

1.5 Write gap length (electrical) is 95 u"+/- 10 u" (measured at first gap null). Read gap length is 12 u" nominal.

1.6 Number of tracks is 40.

1.7 Track pitch of recorded tracks on tape is .0060" nominal (reference only) .

1.8 Centerline to centerline spacing of the channels in the magnetic heads is .121"+/- .001".

1.9 Gap centelrline offset tolerance is +/- 200 u" (see Figure 1).

1.10 Read gap to write gap spacing is .300" +/- .003".

1.11 Tape speed is 103 inches per second for read and write.

1.12 Tape: DC 2750, DC 2500, DC 2300

2.0 ELECTRICAL AND MAGNETIC REQUIREMENTS

2.1 Maximum recording flux density is 38,750 F.T.P.I.

2.2 Recording code is 1,7.

2.3 Read head output at 103 IPS, DC 2750 tape, and 38,750 F.T.P.I. is 7.5 uV P-P per turn minimum.

2.4 Write saturation current (Isat) at 38,750 F.T.P.I. is defined as the write current value required to produce the first 95% of the maximum read output. Total Isat variation shall be +/- 20% of nominal.

2.5 Write current (IW) is set at the value of 1.15 Isat +/- 3% (No equalization used in head testing). Write current rise time shall be 25 nsec. maximum measured from -90% to +90% point. Overshoot shall be 10% maximum of Ø-pk value.

2.6 Resolution is determined as:

$$\frac{\text{Eo at 38,750 F.T.P.I.}}{\text{Eo at 9,687 F.T.P.I}}$$

The minimum resolution shall be 45% without write equalization.

2.7 Resonance frequency for the read head with a capacitance load of 15 pf at the head connector shall be 4.0 MHz minimum and the write head shall be 16 MHz minimum with 15 pf load.

2.8 Magnetic crossfeed is determined by the ratio of the read head output without tape movement and the write head energized at 38,750 F.T.P.I. at IW to the "read-while-write" output signal at 38,750. This ratio to be a maximum of 5%.

2.9 Magnetic crosstalk is determined by the ratio of the read head output while writing with the write head in the same gap line, to the "readwhile-write" output signal at 38,750. This ratio to be a maximum of 500%.

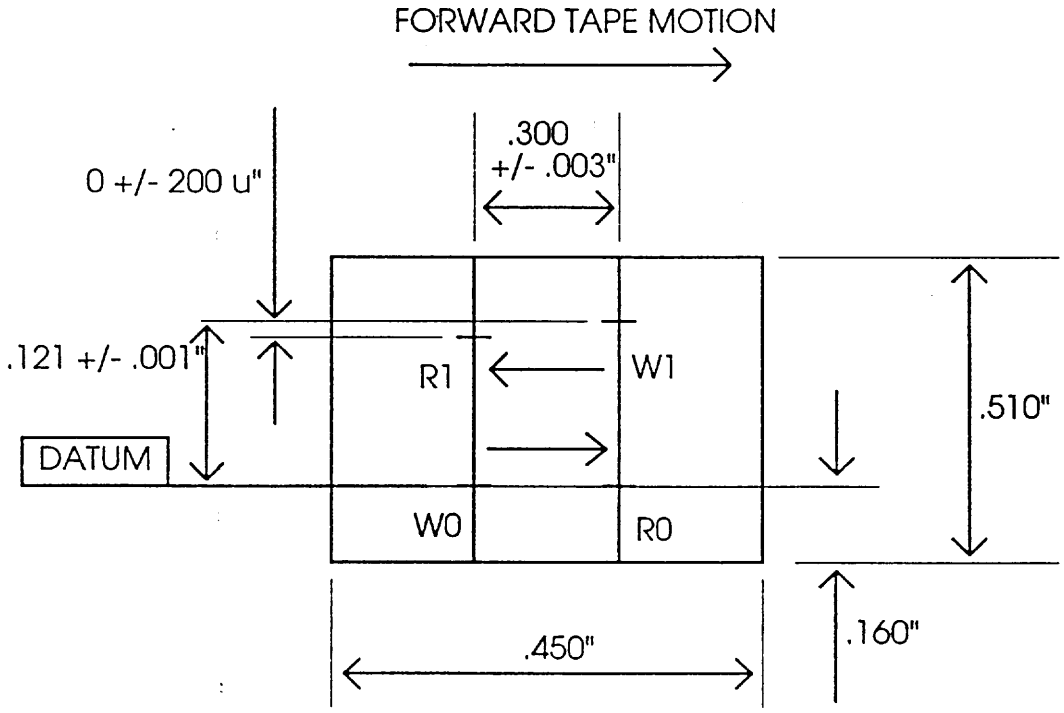
2.10 Overwrite - When a recorded signal of 9,687 F.T.P.I. written at IW is overwritten with a signal at 38,750 F.T.P.I. using IW, the remaining 9,687 F.T.P.I. signal shall be 24 dB below the "read-while-write" out-put level at 9,687 F.T.P.I.

2.11 Read gap and write gap azimuth error - Reference datum line in Figure 1 should be less than 6' of arc.

2.12 Read filter bandpass shall be -3 dB at 4.00 MHz with a -6 dB per octave rolloff.

2.13 Write coil read output - TBD.

FIGURE 1


FORWARD TAPE MOTION
0 +/- 200 u"
.300
+/- .003"
.121 +/- .001"
DATUM
R1
W1
W0
R0
.510"
.450"
.160"

5 RECORDING

5.1 Method Of Recording

The recording method shall be the Non-Return to Zero Mark (NRZ1) method where a ONE is represented by a change in direction of longitudinal magnetization.

The recording current shall be

$1.15 \times I_{sat} \pm 3\%$

where I_{sat} is the current providing 95% of the maximum output at 70,000 ftpi when using a Signal Amplitude Reference Tape Cartridge at nominal temperature. The I_{sat} is measured on the non-saturated side of the saturation current curve.

5.2 Write Equalization

To minimize problems due to the large transition spacing ratio (4:1), some form of write pulse equalization shall be used. The suppression characteristics of write equalization shall correspond to the curve illustrated in the Appendix to within +1/-0.5 db. This section describes a recommended method. Other methods may be used provided that the recorded flux form on the tape, as defined by the suppression curve, is at least as good as the resulting flux form achieved by using the method described below. Regardless of method, the recorded signal must also meet the other requirements specified in this section.

Recommended method:

For every "zero" other than the first "zero" following a "one," one or more additional write equalization pulses shall be inserted into the waveform as shown in Figure 5-1 and Figure 5-2. The center of the inserted pulse shall be exactly as specified in the Figures.

The width t_w of the equalization pulse shall be 1/6 of the minimum nominal transition period t_c (5%) as shown in Figure 5-2.

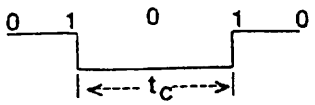


Figure 5.1.1 Pattern ..01010 ..

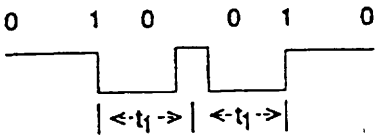


Figure 5.1.2 Pattern ..010010 ..

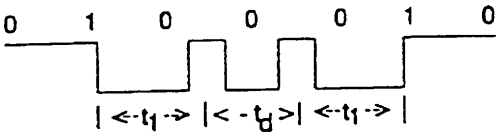


Figure 5.1.3 Pattern ..0100010 ..

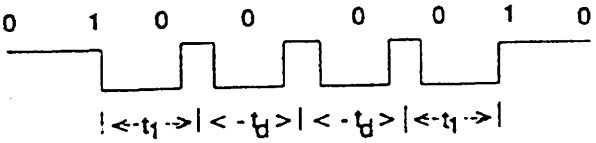


Figure 5.1.4 Pattern ..01000010 ..

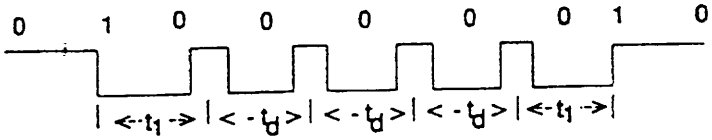


Figure 5.1.5 Pattern ..010000010 ..

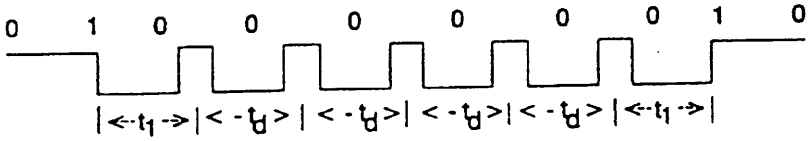


Figure 5.1.6 Pattern ..0100000010 ..

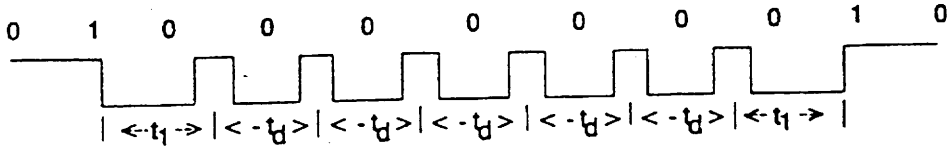


Figure 5.1.7 Pattern ..01000000010 ..

Figure 5-1 Write waveforms and equalization

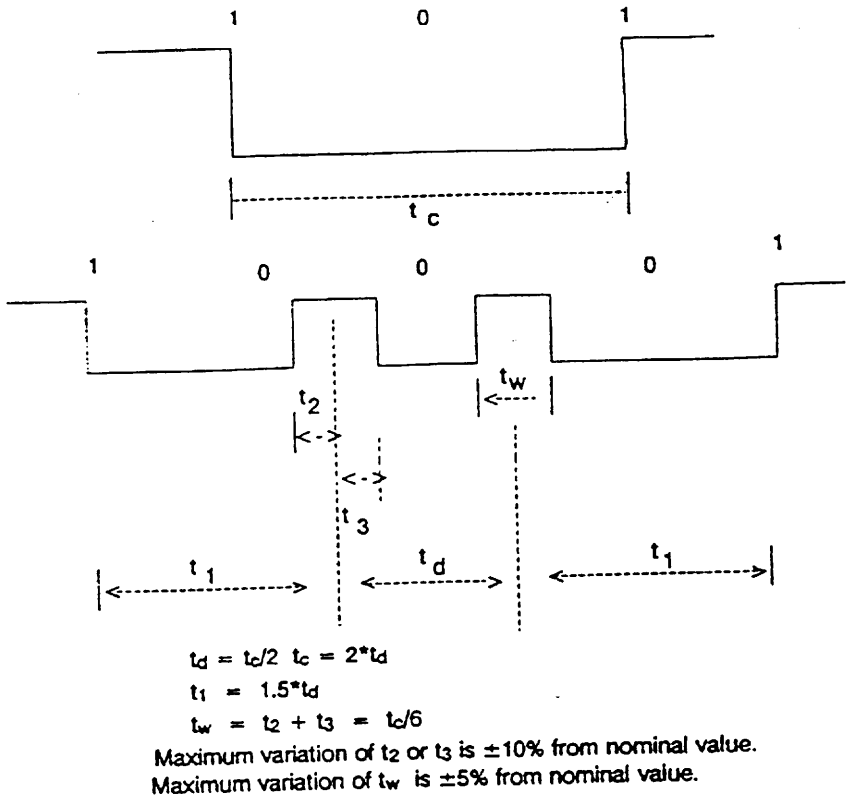


Figure 5-2 Timing information, write equalization

5.3 Transition Densities

The nominal maximum physical recording density or transition density is 70,000 ftpi (2,756 ftpmm). The nominal transition cell length shall be 14.3 micro-inches (0.363 µm).

5.4 Average Transition Cell Length Variations

5.4.1 **Average Transition Cell Length** The average transition cell length is the sum of the distances between the flux transitions in n transition cells divided by (n–1). The tests referred to below may be made in any continuously recorded pattern, provided the first and the last transition cell in the pattern each contain a flux transition.

APPENDIX

Write Equalization Suppression Characteristics

Data Frequency	Suppression
F_d	0 dB
$F_d/2$	5.7 dB
$F_d/4$	8.4 dB