# READ WRITE ANALYZER
# RWA-201B

# MEDIA ANALYSIS

## GMA

### SOFTWARE MANUAL

**Version 1.00**

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# 1. THEORY AND OPERATION

The Guzik Media Analysis (GMA) Program is designed to investigate the performance of magnetic media. The GMA can be utilized with the Engineering Program (T4) and the Production Programs. See the manuals of these programs for test procedures and definitions of relevant terms.

The Guzik Media Analysis Program includes the following tests:

o  <u>Coercivity related tests</u>: analyze uniformity of magnetic properties of the medium.

o  <u>Transitional noise test</u>: measures signal to noise ratio and crest factor as a function of the low erase current.

o  <u>Avalanche tests</u>:. measure the distribution of the amplitude of the missing and extra pulses.

o  <u>Undershoot test</u>: analyzes the amplitude of the undershoot of the read signal. In particular, this test is particularly useful for analysis of the performance of thin film heads.

o  <u>Envelope Analysis</u>: retrieves and plots the envelope of the existing signal, and displays track average amplitude and maximum negative and positive modulation.

In general, the results of the GMA tests may either be tabulated or plotted. The test results may be concurrently stored in a file (see section 2.5.3). Note, however, the following exceptions:

o  Result of the transitional noise test cannot be plotted.

o  The track envelope, plotted using the **Envelope Analysis Menu,** may neither be tabulated nor stored in a file. This restriction is imposed because of the high number of envelope samples produced during the test.

For the coercivity related tests, and for envelope analysis, several measurements of the same test may be plotted together. Thus measurements performed with different parameter settings or at different locations on the disk may be compared.

## 1.1 COERCIVITY RELATED TESTS

In coercivity related tests the following operations are performed:

1. Isolated pulses are written on the track. The write current is set in the System Parameters menu. This current should be set high enough to saturate the track.

2. The envelope of the signal is measured.

3. The Track is DC erased with a low erase current.

4. The envelope of the residual signal is measured.

5. The ratio of the residual TAA and the TAA of the saturated track is computed.

Steps 1-5 are repeated for a user specified set of low erase currents. The user specifies the range of low currents and the increments. During the test the low erase currents may be controlled with a resolution of 0.25 mA. The number of low erase current settings selected affects the length of the tests and the accuracy of the results.

Coercivity related tests are designed to analyze uniformity of the magnetic coating of the disk. For this purpose, the track is divided into up to 64 sectors. Measurements are performed and results are displayed for each sector individually.

Four coercivity related tests are available with the Media Analysis Program:

o   Low Current Erase Test

o   Critical Current Test – One Track Only

o   Multitrack Critical Current Test – Selected Sectors

o   Multitrack Critical Current Test – Extreme Sectors

All four tests follow the general procedure described at the beginning of this section. The Low Current Erase test determines the ratio of TAAs produced by user specified low erase currents. The three Critical Erase Current tests determine the low erase current that produces a given ratio of TAAs. See sections 1.1.1 and 1.1.2 for further details.

## 1.1.1 THE LOW CURRENT ERASE TEST

For the Low Current Erase test, the user specifies a set of low erase currents. The program then determines the ratio of TAAs produced by each user specified low erase currents.

Figure 1.1 shows typical results of the Low Current Erase test. As can be seen, different sectors of the same track produce different residual amplitudes for the same erase current. This indicates lack of uniformity of the magnetic disk coating.
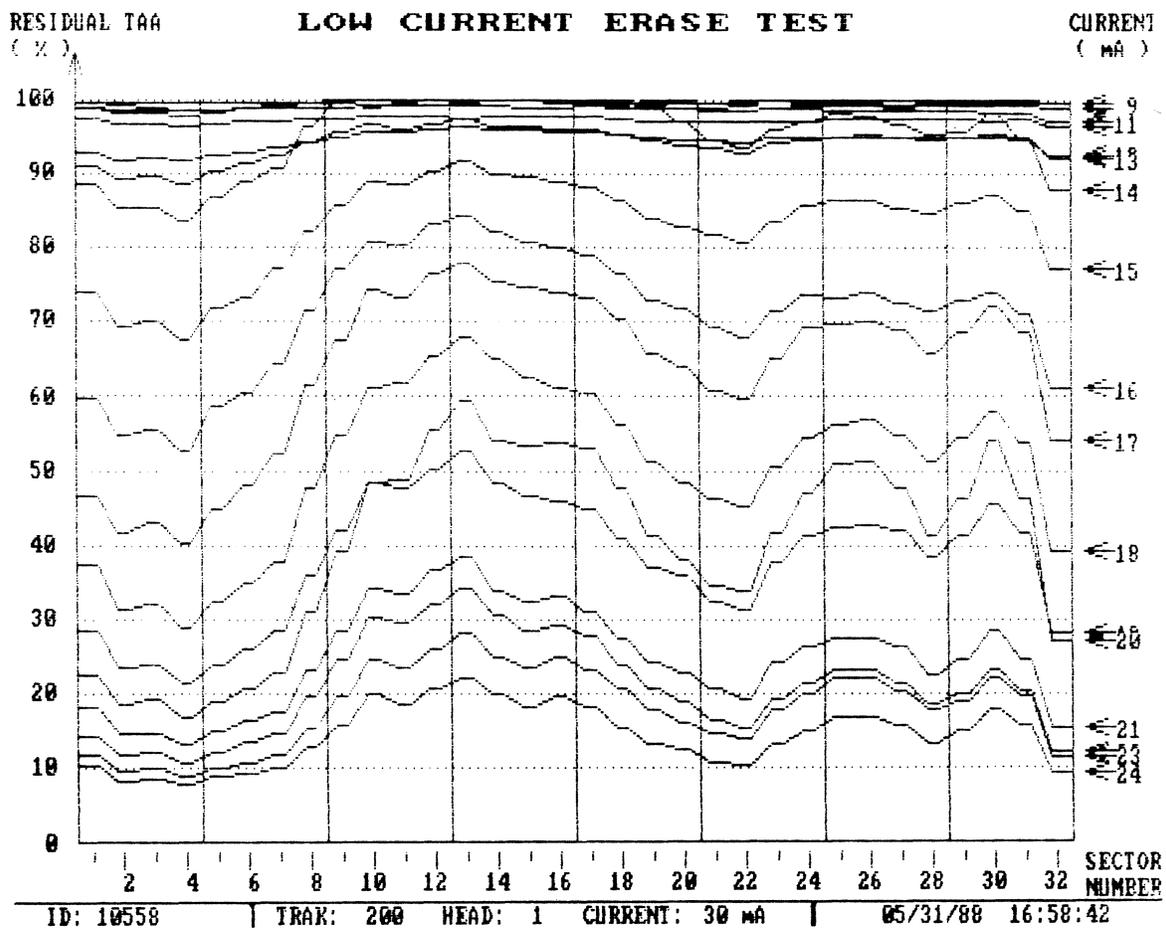


**Figure 1.1: Low Current Erase**

## 1.1.2 THE CRITICAL ERASE CURRENT TESTS

In the Critical Erase Current tests the user specifies a ratio between the residual TAA and the original TAA. This ratio is called the **Critical Amplitude**. Typically the user will choose a critical amplitude of 50%. The low erase current that produces this critical amplitude is called the **critical erase current**. The purpose of the Critical Erase Current tests is to determine this critical erase current. The tests determine different critical erase currents for each sector.

Three Critical Erase Current tests are available with the media analysis program. One determines the critical erase currents on a single track. The other two measure the critical current across several tracks.

**Critical Current Test — One Track Only**

This test determines the critical erase current for each sector of the current track. Plots made for different critical amplitudes may be displayed together. Figure 1.2 shows the results of the Critical Erase Current test for several critical amplitudes.

**Multitrack Critical Current Tests**

The Multitrack Critical Current tests perform the Critical Current test along several tracks. The user specifies the tracks to be tested. Because the volume of the results is high (a critical erase current for each sector of each track that is tested) the user selects a subset of the results that he wishes to be output. He may do this in two ways:

**Multitrack Critical Current Test — Selected Sectors**

For the Multitrack Critical Current test — Selected Sectors, the user specifies a set of up to ten sectors. The critical erase currents will only be determined for the selected sectors. Figure 1.3 shows an example of the plot produced by this test.

**Multitrack Critical Current Test — Extreme Sectors**

For the Multitrack Critical Current test — Extreme Sectors, the critical erase currents are determined for each sector, but only two critical erase currents are displayed for each track: the sectors for which the critical erase current attains a maximum and minimum value along each track. The numbers of the sectors where these extreme values are attained are reported as well. Figure 1.4 shows an example of the plot produced by this test.
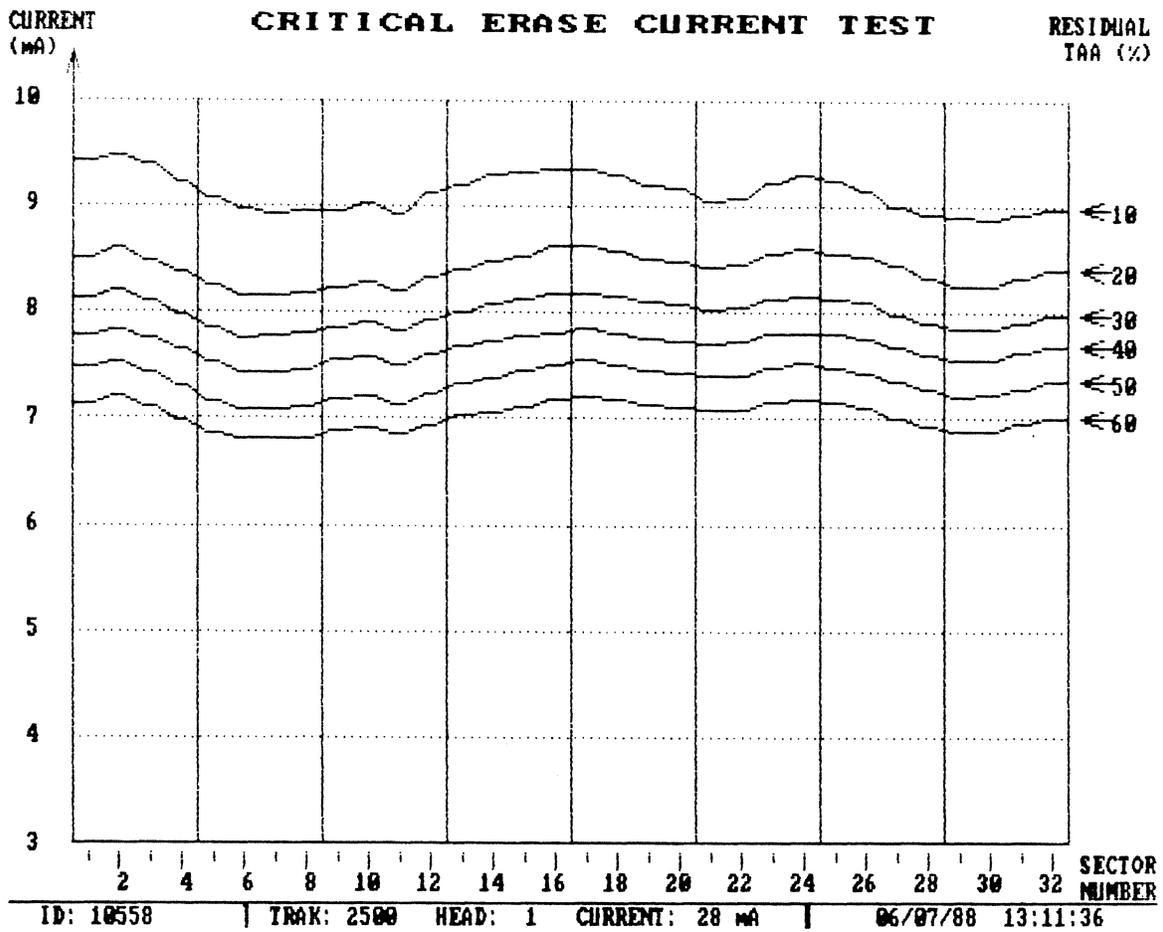
**Figure 1.2: Critical Current Test - One Track Only**

**CRITICAL ERASE CURRENT TEST**

CURRENT (mA)

SECTOR NUMBER

Critical Amplitude = 50 %

ID: GOLD | TRAK: 2500 HEAD: 0 CURRENT: 28 mA | 06/07/88 15:47:02
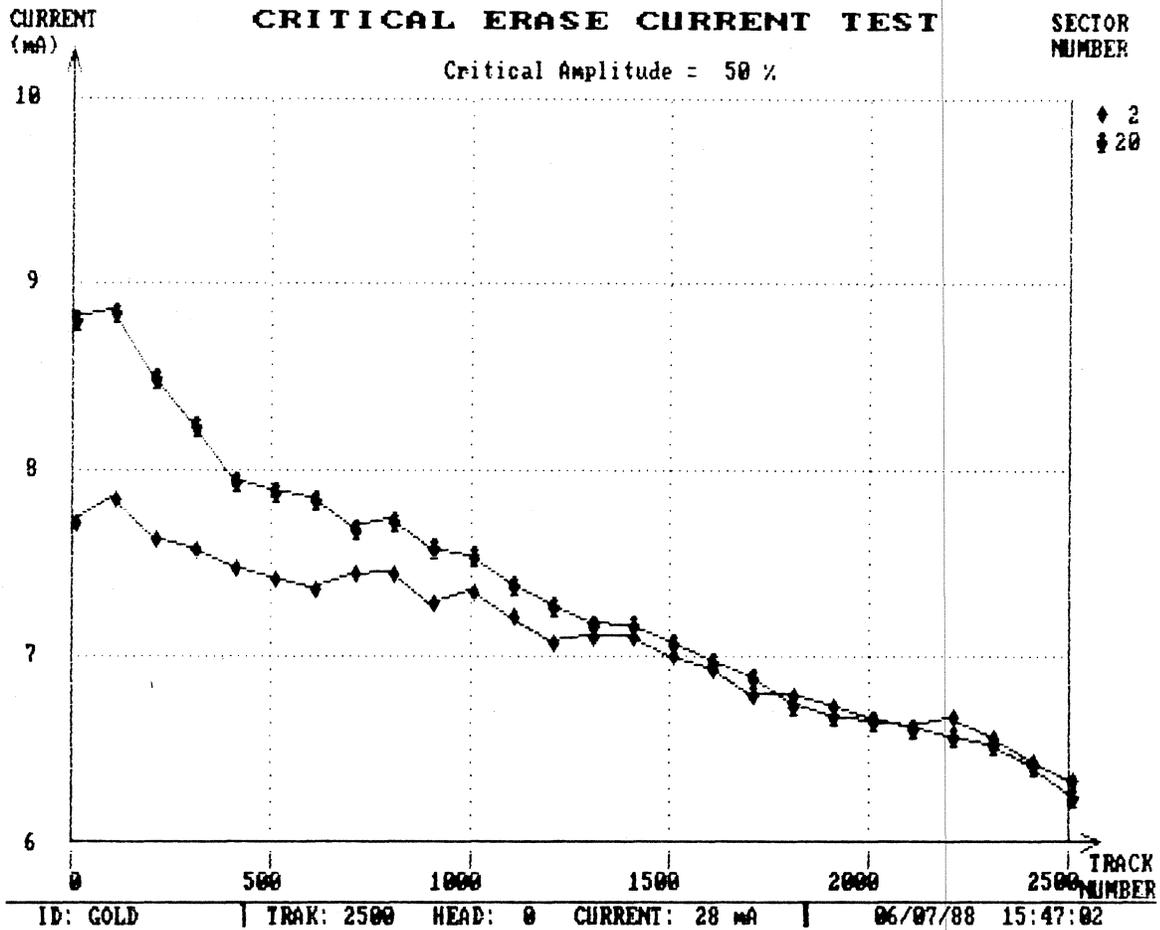
Figure 1.3: Multitrack Critical Current Test - Selected Sectors
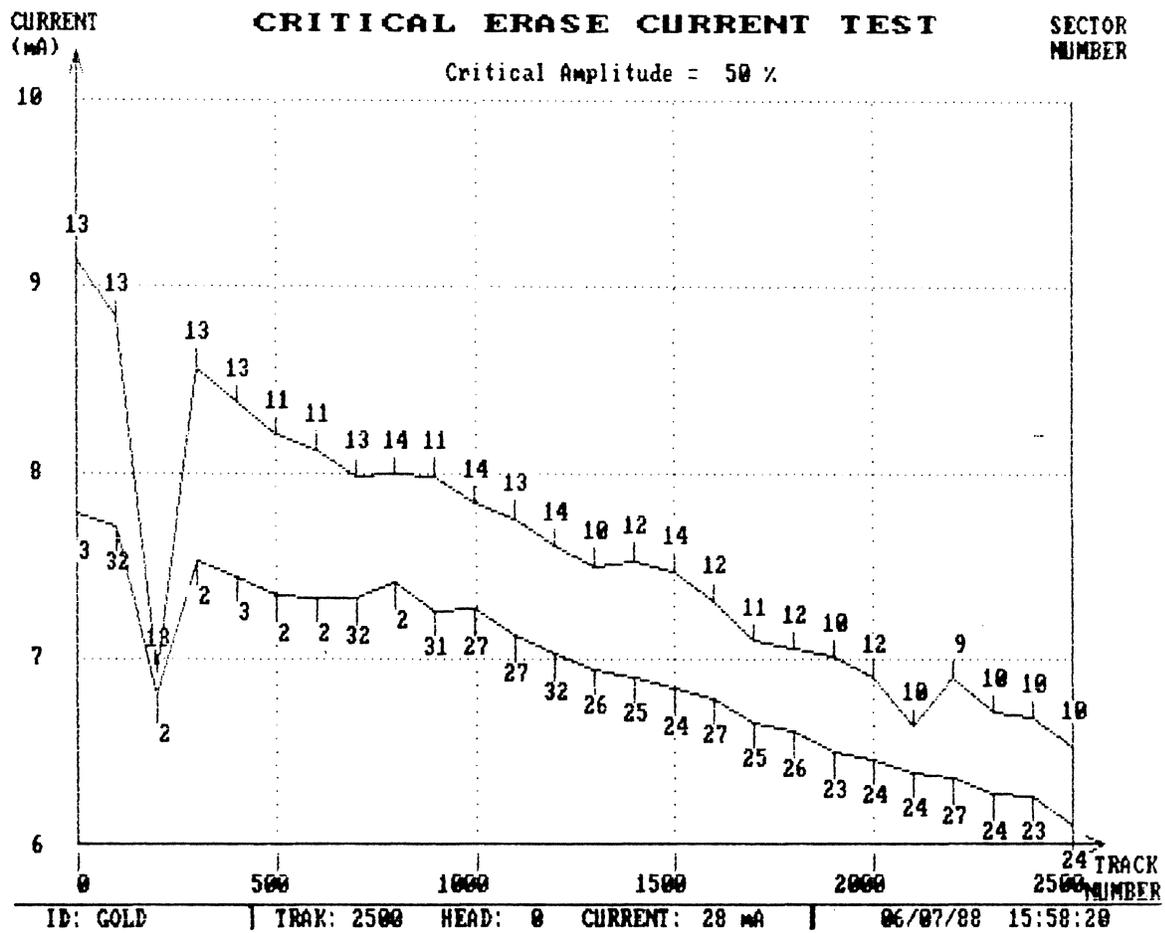
**Figure 1.4: Multitrack Critical Current Test Extreme Sectors**

## 1.2 THE TRANSITIONAL NOISE TEST

Transitional Noise, generally measured in terms of **the signal to noise ratio**, is produced when the field generated by a gradually changing write current is applied to a saturated medium.

The ability of the RWA to control the erase current in 0.25 mA steps allows emulation of transitional noise along the whole track. To conduct the Transitional Noise test the following operations are performed:

1. A 2F signal is written.

2. Amplitude of the 2F signal is measured.

3. Track is DC erased with high erase current, thus saturating the medium.

4. Track is DC erased with a low erase current in the opposite direction to step (3).

5. $V_{rms}$ of the residual signal is measured and the signal to noise ratio is calculated according to the following formula:

$$\text{Signal to Noise Ratio (db)} = -20 \log_{10} ( V_{rms} / TAA )$$

6. Crest factor is measured.

The test is repeated for the set of currents specified by the user. The test current may have an increment as small as 0.25 mA. The result of the test is represented as a table. The low erase current for which the signal to noise ratio attains a minimum value and the crest factor attains a maximum value are marked.

The user specifies the value of high erase current (item X of the track test menu), a set of low erase currents (item C of the track test menu), and the erase direction (item W of the track test menu). Note that the low erase current (item Y of the track test menu), and the erase mode (item Z of the track test menu) do not affect the test. Figure 1.5 shows an example of the Transitional Noise test.

```
                          ***  NOISE TEST  ***

    ID:  105587          06/07/88   14:36:15      TRACK #  2000      HEAD #     1
    -----------------------------------------------------------------------------

    | Filter: FILTER 2    | Erase Dir: POS | Period:     200nS  | Hi:   25.00mA
    -----------------------------------------------------------------------------
      Low          Noise       Peak     res. TAA    Low        Noise      Peak     res. TAA

      5.00mA      30.53db     17.9%     92.92%    11.50mA     29.90db    18.4%     2.41%
      5.50mA      30.53db     16.8%     89.71%    12.00mA     29.97db    18,4%     2.33%
      6.00mA      30.55db     17.9%     80.17%
      6.50mA      30.27db     17.9%     64.06%
      7.00mA      30.30db     18.4%     57.39%
      7.50mA      30.02db     17.9%     38.70%
      8.00mA      28.89db     22.1%     22.13%
      8.50mA      27.46db     24.7%     17.20%
      9.00mA NP   27.02db     25.3%     10.16%
      9.50mA      27.24db     24.2%      6.15%
     10.00mA      28.01db     23.2%      4.18%
     10.50mA      28.73db     21.6%      3.28%
     11.00mA      29.36db     19.5%      2.78%
```

**Figure 1.5:  Transitional Noise Test**

## 1.3  AVALANCHE ANALYSIS TESTS

The purpose of these tests is to analyze the distribution of amplitudes of the data pulses. This is done by running the read signal through the RWA read channel using variable thresholds. The user specifies the range of thresholds to be used for each test and the maximum number of threshold settings within that range.

All tests are performed on current track with current head. The write current and clock rate are specified in the System Parameters menu ( see Figure 2.9). The selection of filter and time constant also affects the results of these tests.

Avalanche Analysis tests are of three types:

     o   Missing Pulse Avalanche Test

     o   Extra Pulse Avalanche Test

     o   Undershoot Test

See sections 1.3.1, 1.3.2 and 1.3.3 for details.

## 1.3.1  THE MISSING PULSE AVALANCHE TEST

During the Missing Pulse Avalanche test the number of pulses falling below a threshold is counted. This is repeated for a sequence of thresholds.

The Missing Pulse Avalanche test has two modes of operation:

     o   **Synchronous** -- In this mode the number of missing pulses is determined by the number of comparator error. Single missing pulses are detected. Above a certain threshold the data separator is not able to synchronize to the read data and the results are meaningless. Therefore, the user specifies a limit on the number of missing pulses at which the test is terminated.

     o   **Asynchronous** -- In this mode the data separator is not involved and therefore the threshold can be selected from a wider range than is possible in the synchronous mode. However, because the total number of pulses can vary (for example as result of rotational speed variation), single missing pulses cannot be detected.

During the Missing Pulse Avalanche test in synchronous mode, the following operations are performed:

    1.   Pattern selected by the user ( item **3** of Track Test menu) is written on the track. It is recommended that 2F pattern be used, because this produces the highest flux

transition density. User has the option not to write at this stage, in which case the pattern existing on the track will be used.

2. Threshold varies according to range and number of thresholds set by user. Step (3) is performed for each threshold. Test terminates when the number of missing pulses at any threshold exceeds the limit specified by user.

3. The number of comparator errors counted represents the **missing pulse count**.

Figure 1.6 gives an example of missing pulse avalanche test in the synchronous mode.

NUMBER OF PULSES

**AVALANCHE CURVE**

| TRAK | HD | PTRN | FILTER |
|------|-----|------|--------|
| 2500 | 0 | B6D9 | FILTER 1 |

◆ Missing Pulse Test
Data Synchronization: ON

Pulse Rate >          1000.
  at      102.1  % threshold

Rate 0 through TH 96.3

Time Constant = 12.00

ID: **GOLD**

06/07/88          16:13:44
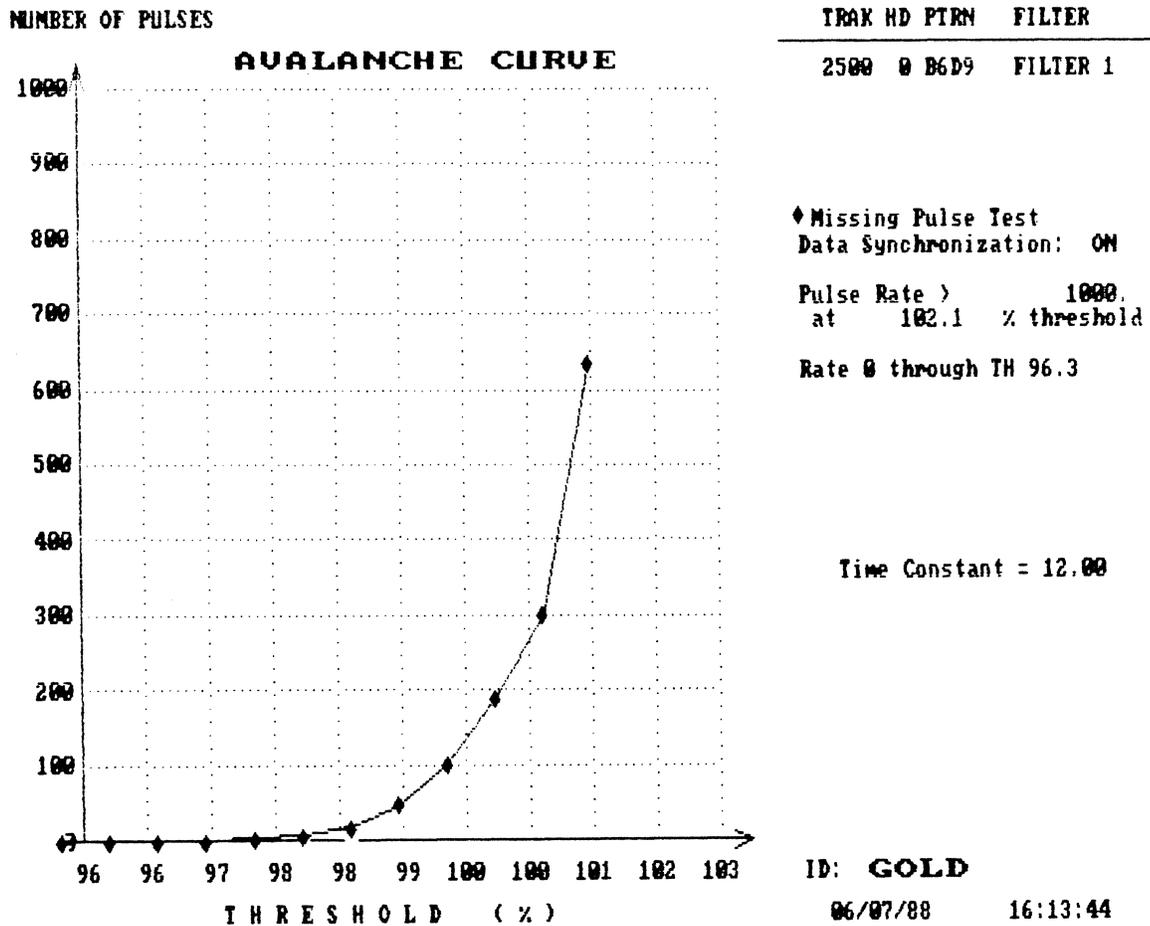
**Figure 1.6: Missing Pulse Avalanche Curve (Synchronous Mode)**

To conduct the missing pulse avalanche test in the asynchronous mode, the following operations are performed:

1. Pattern is written as in step (1) of Synchronous Missing Pulse Avalanche test.
2. Threshold is set to 50%, and the total number of read pulses (T) is counted.
3. Threshold is varied according to range and number of thresholds set by user. Steps (4) and (5) are performed for each threshold.
4. Number of read pulses (P) exceeding threshold is counted.
5. **Missing pulse rate** is calculated using the following formula:

$$\text{missing pulse rate (\%)} = 100\,(\,T - P\,)\,/\,T$$

Figure 1.7 gives an example of the Missing Pulse Avalanche test in and asynchronous mode.

**Figure 1.7: Missing Pulse Avalanche Curve (Asynchronous Mode)**

## 1.3.2 THE EXTRA PULSE AVALANCHE TEST

The extra pulse avalanche test counts the number of pulses exceeding a test threshold. The test is repeated for a sequence of thresholds.

During the extra pulse avalanche test, the following operations are performed:

1. 2F pattern is written on the track. Envelope of this signal is stored for reference.
2. Track is DC erased. Items X,W,Y and Z of the Track Test menu (see section 2.4) set the mode, direction and value of the erasing current.
3. The stored envelope of the 2F signal is recreated. Threshold varies according to range and number of thresholds set by user. Item (4) are performed for each threshold.
4. Number of read pulses exceeding the threshold is counted.

User specifies the Y-scale that represents the number of extra pulses counted . Fig. 1.8 gives an example of Extra Pulse Avalanche curves.

Figure 1.8: Extra Pulse Avalanche Curve

## 1.3.3 THE UNDERSHOOT TEST

The Undershoot test determines amplitude of undershoot of the read signal. The number of read pulses exceeding a test threshold is counted, as in the extra pulse test.

To conduct the Undershoot test, the following operations are performed:

1. Isolated pulses with 1/8 of the 2F frequency are written on the track.
2. The threshold is set to 50%, and total number of read pulses (T) is counted.
3. Threshold varies according to range and number of thresholds set by user. Items (4) and (5) are performed for each threshold.
4. Number of read pulses (P) exceeding threshold is counted.
5. **Undershoot rate** is calculated using the following formula:

$$\text{undershoot rate (\%)} = 100 \, P \, / \, T$$

Figure 1.9 shows an example of the overshoot test. The undershoot rate is over 100%, when the undershoot of the read pulse produces additional read pulses in the corresponding range of thresholds. The highest amplitude of undershoot pulses corresponds to the point where undershoot rate drops back to 100%.

PULSE RATE
( % )

AVALANCHE CURVE
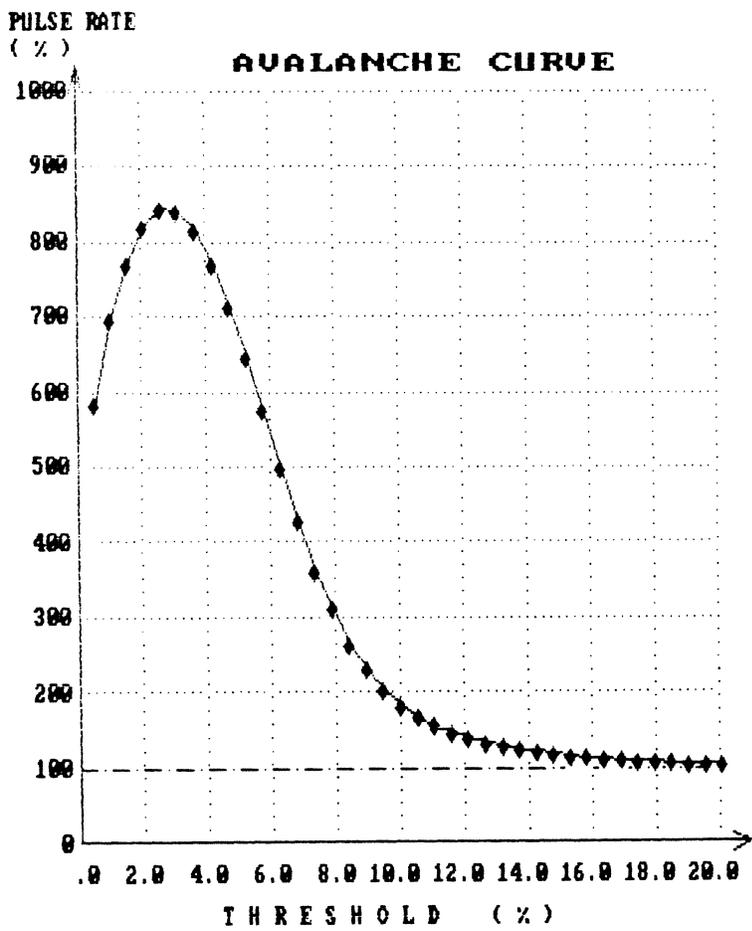


| TRAK HD PTRN | FILTER |
|---|---|
| 2500  1 Iso | FILTER 2 |

♦ Undershoot Test

Time Constant = 42.67

ID:  GOLD

THRESHOLD   ( % )

06/07/88        17:00:42

**Figure 1.9:  Undershoot Test**

## 1.4 ENVELOPE ANALYSIS

In Envelope Analysis the user may retrieve and display the envelope of a previously recorded signal. The user may display several envelopes on the same plot for comparison. Two types of Y-scaling are available:

Absolute scale in mV.
Relative scale in percent of TAA.

The user also specifies the maximum and minimum values for the Y-scale. Note that after the scale type or scale range is changed, all previous plots are erased.

The Envelope Analysis Plot also displays the TAA of the signal, the maximum positive and negative modulation of the envelope, and the locations of the maximum modulations. See Figure 1.10 for an example of envelope analysis plot.

## TRACK ENVELOPE

| | |
|---|---|
| TRACK | 2300 |
| HEAD | 1 |
| PATTERN | FFFF |
| TAA (mV) | .75 |
| POS. MOD. (% TAA) | 6.3 |
| LOCATION (SECTOR #) | 6 |
| NEG. MOD. (% TAA) | - 7.8 |
| LOCATION (SECTOR #) | 13 |



ID: GOLD          TRAK: 2300     HEAD:  1                    06/07/88   17:02:01
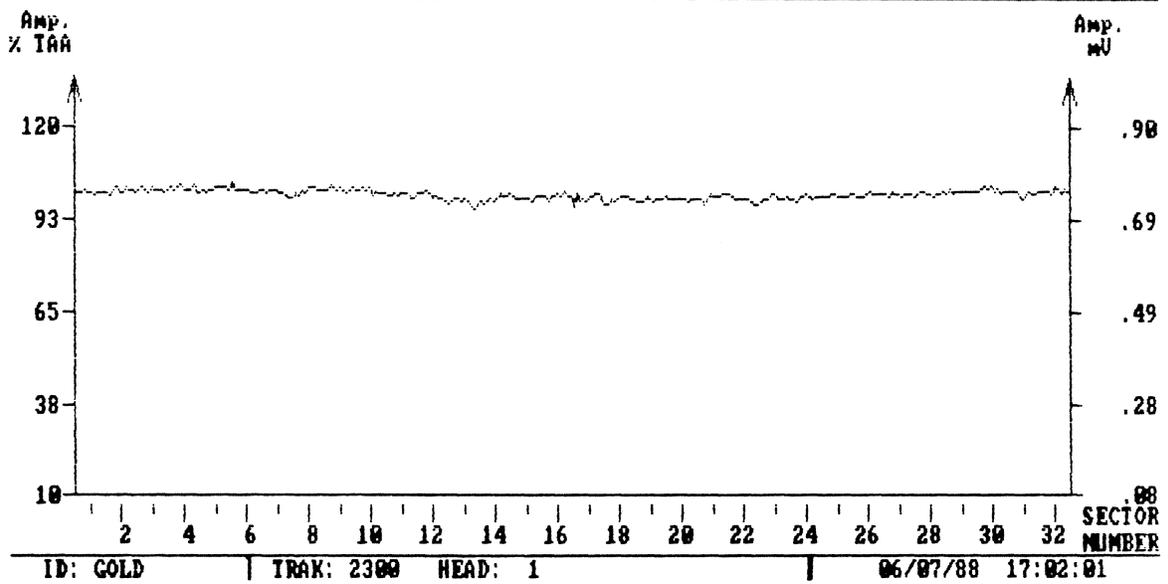
Figure 1.10:  Envelope Analysis

## 2. GUZIK MEDIA ANALYSIS (GMA) PROGRAM

## 2.1 INTRODUCTION

The Guzik Media Analysis (GMA) program is a menu driven program developed for the Guzik Read Write Analyzer RWA-201B; it is designed to provide physical characterization of the disk drive head, HDA, or the magnetic medium used for recording. Figure 2.1 shows the GMA menu configuration.

The GMA program features the following tests:

    o   Sector testing (see section 2.3):

            Low Current Erase test
            Critical Current tests

    o   Avalanche tests (see section 2.4.1):

            Missing Pulse tests
            Extra Pulse test
            Undershoot test

    o   Envelope Analysis ( see section 2.4.2):

            Display track envelope
            Track average amplitude (TAA)
            Positive and negative modulation

    o   Noise Test (see section 2.4.3):

Assignment of function keys is detailed in section 2.2 and Fig. 2.2.

F1: SECTOR TESTING MENU

F2: TRACK TEST MENU
        Avalanche menus:
                6: MISSING PULSE MENU
                7: EXTRA PULSE MENU
                8: UNDERSHOOT MENU

                K: ENVELOPE ANALYSIS MENU

F3: SYSTEM PARAMETERS MENU
                E: CALIBRATION MENU
                F: FILE MANAGEMENT MENU
                O: INTERFACE MENU

**Figure 2.1: GMA Menu Configuration**


## 2.2 FUNCTION KEYS ASSIGNMENT

Function keys select high level menus and invoke special actions. The line at the bottom of the screen displays labels of non-shift enabled function keys, the status of toggle keys and the current ID. Figure 2.2 shows the function keys assignment.

| KEY | LABEL | FUNCTION |
|---|---|---|
| F1 | SECT | Sector Testing menu |
| F2 | TRAK | Track Test menu |
| F3 | SYST | System Parameters menu |
| F4 | RST | Reset RWA |
| F5 | | Not used |
| F6 | P-ON/OFF | Printer on/off (toggle) |
| F7 | DOS | Exit menu |
| F8 | RECL | Recalibrate drive |
| Shift F8 | | Print screen |
| F9 | ID:xx | Enter ID |
| F10 | DRV ON/OFF | Select/deselect drive (toggle) |

**Figure 2.2: Function Key Assignment**

## 2.3 THE SECTOR TESTING MENU

Figure 2.3 shows the Sector Testing Menu. Press F1 to access menu.

```
            ***   SECTOR TESTING  ***

1...Number of Sectors (per Track)                    32
2...Test Averaging Number                             1
3...Erase current range (mA)     FROM  7.00  TO 12.00  INC  1.00
4...Critical Amplitude                        50.00 %
5...Tracks:                      FROM     0  TO   305  INC   1
6... Sectors: { 10 20 30 }

_____

LOW CURRENT TEST
                          A...Make Table      S...Make Plot
CRITICAL CURRENT TEST -- ONE TRACK ONLY
                          B...Make Table      T...Make Plot
MULTITRACK CRITICAL CURRENT TEST -- SELECTED SECTORS
                          C...Make Table      U...Make Plot
MULTITRACK CRITICAL CURRENT TEST -- EXTREME SECTORS
                          D...Make Table      V...Make Plot
_____

     K..Display Plot            I..Erase Plot
```

### Figure 2.3:  Sector Testing Menu

For functions of menu items see below.

**Item 1**
**NUMBER OF SECTORS**

Sets number of sectors into which track is divided (maximum 64).

**Item 2**
**TEST AVERAGING**
**NUMBER**

Sets averaging factor for each measurement.

**Item 3**
**ERASE CURRENT**
**RANGE**

Sets range and increment of low erase currents for each test.

| | |
|---|---|
| **Item 4**<br>**CRITICAL AMPLITUDE** | Sets Critical Amplitude which is residual amplitude as a percentage of original amplitude. Critical amplitude defines critical erase current. |
| **Item 5**<br>**TRACKS** | Sets range and increment of tracks used in multitrack tests. |
| **Item 6**<br>**SECTORS** | Sets sectors used in Multitrack Critical Current Test – Selected Sectors. |
| **Items A, S**<br>**LOW CURRENT TEST** | Perform Low Current test and results are tabulated (A) or plotted (S). |
| **Items B, T**<br>**CRITICAL CURRENT**<br>**TEST– ONE TRACK**<br>**ONLY** | Perform Critical Current test on current track and results are tabulated (B) or plotted (T). |
| **Items C U**<br>**MULTITRACK**<br>**CRITICAL CURRENT**<br>**TEST – SELECTED**<br>**SECTORS** | Perform Critical Current Test on the tracks and sectors specified by items 5 and 6 described above. Results are tabulated (C) or plotted (U). |
| **Item D, V**<br>**MULTITRACK**<br>**CRITICAL CURRENT**<br>**TEST – EXTREME**<br>**SECTORS** | Perform Critical Current Test on tracks selected by item 5. The sectors yielding the highest and lowest critical currents and their corresponding currents are tabulated (D) or plotted (V). |
| **Item I**<br>**ERASE PLOT** | Clears current plot. |
| **Item K**<br>**DISPLAY PLOT** | Displays current plot. |

## 2.4. TRACK TEST MENU

Figure 2.4 shows the Track Test menu through which the following tests are accessed:

o   Avalanche Test menus (Missing Pulse, Extra Pulse, and Undershoot), discussed in section 2.4.1.

o   Envelope Analysis menu, discussed in section 2.4.2.

o   Transitional Noise Test, discussed in section 1.2.

```
          ***      TRACK   TEST  MENU      ***
1...Write then read      2...Sync. Cycle         U...Write Isolated Pulses
E...Erase Negative       R...Erase Positive      A...Erase Adjacent Tracks
3...Pattern              FFFF         : Z=FFFF X=AAAA  Y=B6D9  R=RANDOM
4...Track Number  -      100          5...Head  Number  -       1
B...Step backward                     F...Step forward


————————— Menus ——————————————————————————————————————————————————————
    Avalanche:   6...Missing Pulse    7...Extra Pulse    8...Undershoot

            K...Envelope Analysis Menu


————————— Erase Parameters ————————————————————————————————————————————
    X...High current   25.00      W...Erase direction     POS
    Y...Low  current    8.00      Z...Erase mode          High


————————— Transitional Noise Test —————————————————————————————————————
    C...Erase current range (mA) FROM  7.00  TO 12.00  INC  1.00
    N...Perform Transitional Noise Test
```

**Figure 2.4: Track Test Menu**

For functions of menu items see below.

| | |
|---|---|
| **Item 1**<br>**WRITE THEN READ** | Writes pattern specified in item 3 on the track. |
| **Item 2**<br>**SYNC CYCLE** | Initiates continuous read cycle and observes a prewritten signal. |
| **Item U**<br>**WRITE ISOLATED PULSES** | Writes isolated pulses with 1/8 of the 2F frequency on track. |
| **Item E**<br>**ERASE NEGATIVE** | DC erases the current track once in the negative direction. |
| **Item R**<br>**ERASE POSITIVE** | DC erases the current track once in the positive direction. |

| | |
|---|---|
| **Item A**<br>**ERASE ADJACENT**<br>**TRACKS** | DC erases adjacent tracks. The number of tracks erased on each side of the current track is determined by item S of the System Parameters menu (see section 2.5). |
| **Items 3,4,5, B,F**<br>**PATTERN, TRACK**<br>**NUMBER, HEAD**<br>**NUMBER, STEP**<br>**BACKWARD, STEP**<br>**FORWARD** | See *Read Write Analyzer RWA-201B*, section entitled "Engineering program." |
| **Item 6**<br>**MISSING PULSE** | Accesses Missing Pulse Avalanche Test menu, see section 2.4.1.1. |
| **Item 7**<br>**EXTRA PULSE** | Accesses Extra Pulse Avalanche Test menu, see section 2.4.1.2. |
| **Item 8**<br>**UNDERSHOOT** | Accesses Undershoot Test menu, see section 2.4.1.3. |
| **Item K**<br>**ENVELOPE ANALYSIS**<br>**MENU** | Accesses Envelope Analysis menu, see section 2.4.2. |
| **Item X**<br>**HIGH CURRENT** | Sets high erase current. |
| **Item Y**<br>**LOW CURRENT** | Sets low erase current. |
| **Item W**<br>**ERASE DIRECTION** | Sets erase direction. |
| **Item Z**<br>**ERASE MODE** | Sets erase mode which is the erase mode used in the extra pulse avalanche test. |
| **Item C**<br>**ERASE CURRENT**<br>**RANGE** | Sets of low erase current range used when performing Noise Test. |
| **Item N**<br>**PERFORM**<br>**TRANSITIONAL NOISE**<br>**TEST** | Performs Transitional Noise Test, see section 1.2. |

## 2.4.1 AVALANCHE TEST MENUS

The Avalanche Tests menus are configured and executed by three similar menus, comprising the following:

- o   Missing Pulse Avalanche Test Menu
- o   Extra Pulse Avalanche Test Menu
- o   Undershoot Test Menu

## 2.4.1.1 MISSING PULSE AVALANCHE TEST MENU

Figure 2.5 shows the Missing Pulse Avalanche Test.  The menu is accessed by using item 6 on the Track Test menu.

```
        ***    MISSING PULSE AVALANCHE TEST MENU    ***
-----------------------------------------------------------------

   1...Number of Threshold Settings          40
   2...Number of Revolutions                  1
   3...Threshold Range        FROM    20.0 %    TO    120.0 %


-----------------------------------------------------------------
   D...Data Synchronization: ON
        L...Missing pulse limit              1000
   E...Write Before Test:   ON
-----------------------------------------------------------------

   M...Make Avalanche Table            J...Make Avalanche Plot

   R...Return to Track Test Menu

           Maximum Available Threshold Setting is   114.9 %
```

**Figure 2.5:  Missing Pulse Avalanche Test Menu**

For functions of menu items, see below.

**Item 1**
**NUMBER OF**
**THRESHOLD SETTINGS**

Sets maximum number of thresholds within range specified by item **3**.

**Item 2**
**NUMBER OF**
**REVOLUTIONS**

Sets number of revolutions used for averaging the results.

**Item 3**
**THRESHOLD RANGE**

Sets range of thresholds used when performing test.

**Item D**
**DATA**
**SYNCHRONIZATION**

Select:

ON for synchronous mode.

OFF for asynchronous mode.

**Item L**
**MISSING PULSE LIMIT**

Sets limit on number of missing pulses in synchronous mode ( number of missing pulses determines the y-scale of the plot).

**Item E**
**WRITE BEFORE TEST**

ON - pattern specified in Track Test menu (refer to Figure 2.4 item **3**) is written before test is performed.

OFF - test is performed using the pattern currently recorded on the track.

**Item M**
**MAKE AVALANCHE**
**TABLE**

Performs test, tabulating the results.

**Item J**
**MAKE AVALANCHE**
**PLOT**

Performs test, plotting the results.

**Item R**
**RETURN**

Returns to Track Test menu.

## 2.4.1.2 EXTRA PULSE AVALANCHE TEST MENU

Figure 2.6 shows the Extra Pulse Avalanche Test menu. The menu is accessed by using item **7** on the Track Test menu.

```
        ***    EXTRA PULSE AVALANCHE TEST MENU    ***
----------------------------------------------------------------

      1...Number of Threshold Settings          40
      2...Number of Revolutions                  1
      3...Threshold Range          FROM    .0 %    TO    20.0 %

      4...Scaling (# of pulses)               1000




----------------------------------------------------------------

      M...Make Avalanche Table           J...Make Avalanche Plot

      R...Return to Track Test Menu

           Maximum Available Threshold Setting is    114.9 %
```

### Figure 2.6: Extra Pulse Avalanche Test Menu

For functions of menu items, see below.

**Item 1**
**NUMBER OF**
**THRESHOLD SETTINGS**

Sets maximum number of thresholds within range specified by item **3**.

**Item 2**
**NUMBER OF**
**REVOLUTIONS**

Sets number of revolutions used for averaging the results.

**Item 3**
**THRESHOLD RANGE**

Sets range of thresholds used when performing test.

**Item 4**
**SCALING**

Sets largest number of pulses that can be plotted, allowing user to set scale of Y axis on the plot. The results of Extra Pulse Avalanche test are expressed in absolute number of pulses.

| Item M | Performs test, tabulating the results. |
| MAKE AVALANCHE | |
| TABLE | |

| Item J | Performs test, plotting the results. |
| MAKE AVALANCHE | |
| PLOT | |

| Item R | Returns to Track Test menu. |
| RETURN | |

## 2.4.1.3 UNDERSHOOT TEST MENU

Figure 2.7 the Undershoot Test menu. The menu is accessed by using item **8** on the Track Test menu.

```
            ***    UNDERSHOOT TEST MENU     ***
    _____

    1...Number of Threshold Settings              40
    2...Number of Revolutions                      1
    3...Threshold Range           FROM     .0 %     TO    40.0 %




    _____

    M...Make Table                    J...Make Plot

    R...Return to Track Test Menu

            Maximum Available Threshold Setting is    114.9 %
```

Figure 2.7: Undershoot Test Menu

| Item 1 | Sets maximum number of thresholds within |
| NUMBER OF | range specified by item **3**. |
| THRESHOLD SETTINGS | |

| | |
|---|---|
| **Item 2**<br>**NUMBER OF**<br>**REVOLUTIONS** | Sets number of revolutions used for averaging the results. |
| **Item 3**<br>**THRESHOLD RANGE** | Sets range of thresholds used when performing test. |
| **Item M**<br>**MAKE AVALANCHE**<br>**TABLE** | Performs test, tabulating the results. |
| **Item J**<br>**MAKE AVALANCHE**<br>**PLOT** | Performs test, plotting the results. |
| **Item R**<br>**RETURN** | Returns to Track Test menu. |

## 2.4.2 ENVELOPE ANALYSIS MENU

Figure 2.6 shows the Envelope Analysis menu. The menu is accessed by item K on the Track Test menu.

```
       ***     ENVELOPE ANALYSIS MENU     ***
_____
1...Smoothing:                 OFF
2...Scale Type:    RELATIVE (% TAA)
3...Scale:                     FROM    70.0 %     TO   130.0 %
_____
I...Clear Envelope Plot      J...Plot Envelope      K...Display Envelope Plot
_____
R...Return to Track Test Menu
```

**Figure 2.8: Envelope Analysis Menu**

For functions of menu items, see below.

| | |
|---|---|
| **Item 1**<br>**SMOOTHING** | ON - envelope samples are smoothed before envelope is plotted.<br><br>OFF - envelope samples are not smoothed before envelope is plotted. |
| **Item 2**<br>**SCALE TYPE** | Selects either absolute scale (mV) or relative scale (% of Track Average Amplitude). See item 3 below. |
| **Item 3**<br>**SCALE** | Sets scaling for envelope plot. See item 2 above. |
| **Item I**<br>**CLEAR ENVELOPE PLOT** | Clears all results displayed on plot. |
| **Item J**<br>**PLOT ENVELOPE** | Measures and plots envelope. Calculates TAA and maximum positive and negative modulation of the envelope. |
| **Item K**<br>**DISPLAY ENVELOPE PLOT** | Displays envelope plot. |

**Item R**
**RETURN**                                        Returns to Track Test menu.

## 2.5 SYSTEM PARAMETERS MENU

Figure 2.9 shows the System Parameters menu, which is selected by pressing F3. The menu performs the following functions:

o   Specifies type of device being tested.

o   Sets various global parameters, such as write current, threshold and write frequency.

o   Allows access to System Calibration and File Management menus.

```
                    ***  SYSTEM PARAMETERS MENU  ***

1...Reference radiusIN    1.10        H...OUTER Current mA      30
2...Step size      uIN   31.25        I...INNER Current  mA     26
3...Steps per track          1        J...Track change cur.    100
4...Step rate       mS     .10
5...Maximum track #        305
6...Maximum head #           3        M...Performance Filter FILTER 1
7...Clock period    nS      80
8...Clock freq.    MHz   12.50        O...Interface          ST-506
9...Read/Mis. Thr.% -     50.0        P...Drive number            1
S...Adjacent Tracks         1         D...Rotational speed     3600
Q...ID     radius   IN    1.10        G...Time constant  uSec  12.0



Y...Sync. Point Menu                  V...Cleaning cycle
E...System calibration menu           F...File management menu
```

### Figure 2.9: System Parameters Menu

The System Parameters menu of the GMA program (Figure 2.9 ) differs from the System Parameters menu of the Engineering Program ( see the *RWA-201B* , "Engineering program") by the addition of one item:

| | |
|---|---|
| **Item A**<br>**ADJACENT TRACKS** | Sets number of tracks to be erased on each side of track being tested. |

### Note
This erasure will be performed automatically before each test. To avoid erasure of adjacent tracks, set adjacent track number to zero.

## 2.5.1 SYNC POINT MENU

Sync Point menu (Figure 2.10 ) is accessible from the System Parameters menu. The sync point for the GMA program is set in terms of bytes sectors. For more information, see the *RWA-201B*, "Engineering Program."

```
                ***    SYNC  POINT  MENU    ***

Number of Bytes  26041     Number of Sectors  32     Bytes per Sector    813.78
-------------------------------------------------------------------------------

1...Sync. Point (Byte)                  1100
2...Sync. Point (Sector)                   2

3...Detect Range (Byte)   FROM    1            TO 10350
4...Detect Range (Sector) FROM    1            TO    13


-------------------------------------------------------------------------------

    R...Return to System Parameters Menu
```

**Figure 2.10: Sync Point Menu**

## 2.5.2 SYSTEM CALIBRATION MENU

System Calibration menu is accessible from the System Parameters menu, and is identical to the System Calibration menu provided in the *RWA-201B*, "Engineering Program."

## 2.5.3 FILE MANAGEMENT MENU

The File management menu is accessible from the System Parameters menu, and is identical to the File Management menu provided in the *RWA-201B*, "Engineering Program."

## 2.5.3.1 LOG FILE

The output of all the tests can be stored in a log file. Figure 2.11 shows an example of a log file for the Critical Current test (one track only, number of sectors = 5).

```
D CRICUR    0  ================================
S DRIVID guz1489
S SYSID  RWA123
S DATE   02/11/88
S TIME   18:11:00
I TRACK     0
I HEAD      1
R CLOCK    200.14
I WRTCUR   30
R CRIAMP   50.00
I SECTOR   1
R CURENT    10.89
I SECTOR   2
R CURENT    11.36
I SECTOR   3
R CURENT    11.40
I SECTOR   4
R CURENT    11.29
I SECTOR   5
R CURENT    11.17
S END:   TEST COMPLETED
```

**Figure 2.11: Log File Example**

The Log File consists of a test ID and a sequence of records. Figure 2.12 shows the format of a record in a log file.

T NNNNNN xxx...,

where:

T is the information type:

| | |
|---|---|
| I-Integer | ; 1234 |
| R-Real | ; 23.56 |
| E-Scientific Notation | ; .2344E-56 |
| C-Character | ; S |
| P-Pattern | ; FF7F |
| S-String | ; DRIVID or 12:23:56 |
| L-Logical | ; T or F |
| D-Test ID | ; (See below) |

NNNNNN is the parameter name (6 letters or less)

xxx... is the value of the parameters in ASCII format

### Figure 2.12 Log File Format

Information supplied in a log file is similar in structure to the data displayed on the screen. The sequence of log file parameters can vary. The name attached to each record allows its unique identification.

## 2.5.3.2 TEST IDENTIFICATION AND PARAMETER CODES

The GMA test ID codes are six characters in length. Figure 2.13 shows the test ID codes and their names.

| TEST ID | NAME OF TEST |
|---|---|
| LOWCUR | Low Current test − one track only |
| CRICUR | Critical Current test − one track only |
| NOISET | Noise test |
| CUR-SS | Multitrack Critical Current test − selected sectors |
| CUR-MM | Multitrack Critical Current test − extreme sectors |
| AV-MSS | Missing Pulse Avalanche test |
| AV-EXT | Extra Pulse Avalanche test |
| AV-UND | Undershoot test |
| ENVDAT | "Plot envelope" of Envelope Analysis menu. |

### Figure 2.13 GMA Test Codes

Figure 2.14 shows the log file parameter codes and their descriptions.

| CODE | DESCRIPTION |
|------|-------------|
| DRIVID | drive ID (function key F10) |
| SYSID | system ID |
| DATE | date test is performed |
| TIME | time test is performed |
| WRTCUR | write current − mA (System Parameters menu) |
| TIME-C | time constant − $\mu$S (System Parameters menu) |
| CLOCK | clock period − nS (System Parameters menu) |
| TRACK | track number (may change during test) |
| HEAD | head number (Track Test menu) |
| CRIAMP | critical amplitude − % (Sector Testing menu) |
| DATSNC | data sync − ON/OFF (Missing Pulse Avalanche test) |
| LIMIT | pulse limit (MIssing Pulse Avalanche test) |
| SECTOR | sector number |
| CURENT | erase current − mA (changes during test) |
| THRESH | read threshold − % (changes during test) |

**Figure 2.14: Log File Parameters Description**

Figure 2.15 shows the codes that identify the test results.

| CODE | DESCRIPTION |
|------|-------------|
| RTAA | residual TAA − % of sector or track TAA |
| MAXCUR | maximum critical current for any sector − mA |
| MAXSEC | sector where this maximum occurs |
| MINCUR | minimum critical current for any sector − mA |
| MINSEC | sector where the above minimum occurs |
| PLSRAT | pulse rate − % |
| PLSCNT | pulse count |
| ZERCOU | threshold at return to zero pulse rate − % |
| LASTTH | thrs before missing pulse limit is exceeded − % |
| MAXUND | maximum undershoot − % |
| TSGNS | signal/noise ratio − db |
| TEPEAK | crest factor − % |
| TAA | track average amplitude − mV |
| POSMOD | maximum positive modulation − % of track TAA |
| NEGMOD | maximum negative modulation − % of track TAA |

**Figure 2.15: Log File Test Results**