BRIAN
INSTRUMENTS

OPTION R

ANALOG/ALIGNMENT ATTACHMENT

(SINGLE/DUAL CHANNEL)

WITH INTELLIGENT SERIES/CATEYE ALIGNMENT SUPPORT

OPERATION AND USE

1 FEBRUARY 1993

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INTELLIGENT SERIES ALIGNMENT DISKETTES

INTRODUCTION

The **INTELLIGENT SERIES** precision analog alignment diskettes offered by **BRIAN INSTRUMENTS** are sub-micron position reference standards that are designed to be used with the Tester to significantly improve accuracy and repeatability compared to conventional ***cateye*** techniques as described on the following pages.

Because traditional ***cateye*** style analog diskettes are designed for viewing with an oscilloscope, what can be measured is restricted and limited by the technique and scope. Even when these diskettes are used with the **BRIAN** Testers, there are limiting factors of measurability such as effects due to media Modulation/Eccentricity and Humidity that are eliminated using the **INTELLIGENT SERIES.** Because of the expanded measuring signals provided by the **INTELLIGENT SERIES,** the range of measurements is greatly enhanced with results provided in direct units of measurement (***micrometers, minutes of arc*** and ***microseconds***), eliminating cumbersome conversion charts and/or complicated formulas.

Alignment diskettes are created in controlled temperature/humidity environments. However, in the user environment humidity differences cause the alignment signals to move as the diskette expands/contracts due to increased/decreased moisture content. This error can be a noticeable percent of a Track width, negating the original precision of the diskette. For this reason, an **ENTER HUMIDITY** function is active, when used with the **INTELLIGENT SERIES** alignment diskette, that corrects for this error, maintaining the original precision of the diskette. The value for **ENTER HUMIDITY** is inserted in ***%RH*** which is easily determined via a conventional humidity gauge. In addition to this, the Tester also provides automatic correcting for errors due to Modulation/Eccentricity. In this manner, virtually all external error producing phenomena is eliminated, keeping the accuracy of the diskette constant throughout the life of the diskette.

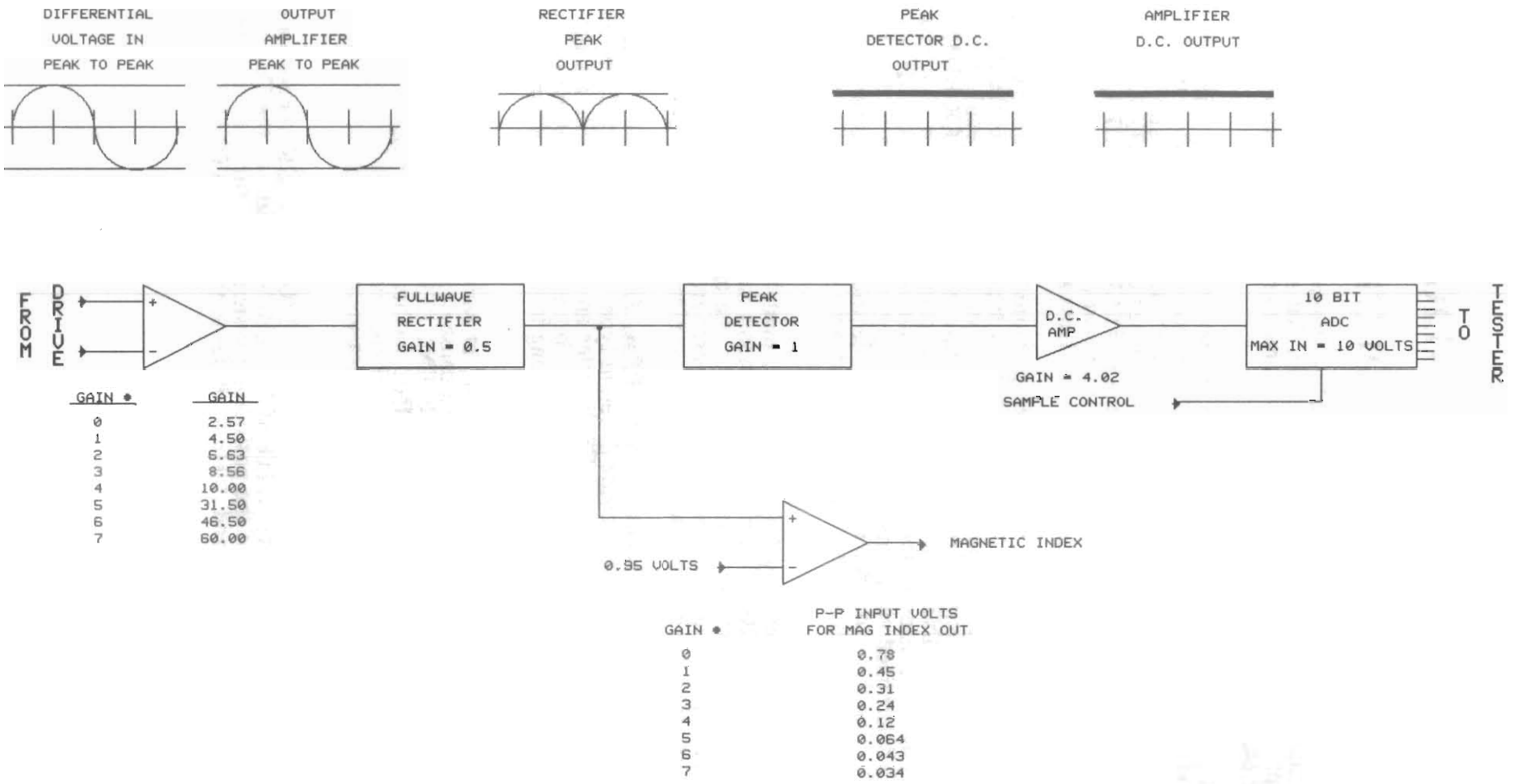
For ***cateye*** alignment diskettes, typically a single Azimuth burst pattern is provided, restricting the measuring range. The **INTELLIGENT SERIES** incorporates multiple burst sets, broadening the measurement range and accuracy considerably. To minimize errors due to noise accumulations and effects of Modulation and Eccentricity, the multiple burst sets are repeated around the Track. In conjunction with the Tester, the measurement range and accuracy are improved significantly over previous measuring techniques.

Drives are organized based on ***Tracks Per Inch, RPM, Transfer Rate***, and ***Media Type*** (DD, HD, ED). For this reason, it is necessary to provide different types of alignment medium, characterized for each class of drive. All **INTELLIGENT SERIES** diskettes are color coded with a large colored dot to assist identifying the drive class in which it is to be used. To prevent inadvertent use of a diskette in the wrong drive class, the Tester provides premeasurement testing to verify that the drive and media match, producing an error message when incorrect.

All alignment diskettes have a limited useful life, at which time noise accumulations due to residual magnetism and other noise generating phenomena cause deteriorating measuring accuracies, distorting the original precision of the diskette. The **INTELLIGENT SERIES** is preset to **75** alignments and the Tester includes a **NUMBER OF ALIGNS REMAINING** facility, via the **PRELIMINARY ALIGN** function, that interrogates the diskette by the Tester, to track the number of useful alignments that are left on the diskette. This protect system assures accuracy of measurement throughout the life of the diskette and so that replacements may be ordered in a timely manner.

For even more advanced measurement capabilities, a **MULTITRACK** version of each diskette type is available and operates with the **MULTITRACK ALIGN** function of the Tester. Beyond the general alignment information, a profile of the positioning system is produced to include ***Runout, Maximum Deviation/Linearity, Separation***, and ***Average***. Refer to the **MULTITRACK ALIGN TEST** located in the **ALIGN** Row, Key **E** for details.

ANALOG RECEIVER
BLOCK DIAGRAM



GAIN #	GAIN
0	2.57
1	4.50
2	6.63
3	8.56
4	10.00
5	31.50
6	46.50
7	60.00

GAIN #	P-P INPUT VOLTS FOR MAG INDEX OUT
0	0.78
1	0.45
2	0.31
3	0.24
4	0.12
5	0.064
6	0.043
7	0.034

FIGURE 1

BRIAN INSTRUMENTS, INC.

ANALOG RECEIVER LAYOUT

D | | BRIKON/QUICKLIGN SERIES REV : A

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ABOUT THE ANALOG RECEIVER

The **ANALOG RECEIVER** is connected to the rear of the Tester through a 40 pin I/O cable. Included with the **ANALOG RECEIVER** are six colored probes that are connected to the drive under test for receiving analog and digital information (see **FIGURE 1**). Two types of **ANALOG RECEIVERS** are available; single and dual channel. If equipped with the dual channel (**OPTION R/D**) receiver, the **INDEX IN** and **INDEX OUT** probes are replaced with a ***YELLOW*** twisted probe pair used for the additional analog channel. In this configuration, the switch under the receiver is used to select between single and dual channel operation. The dual channel analog capability is very useful in **SOFTWARE DUPLICATION** environments where the analog signals for each Head are separated and not switched on the drive logic. In these environments, the analog is switched by the Tester. The use of each of these probes is described as follows.

READ SIGNAL

These **WHITE TWISTED PAIR** probes are used to receive the analog signals from the drive. These probes are to be connected to the Analog Read Signal test points of the drive. The recommended connection is between the amplifier and the differentiator circuits. If the only connection available is after the differentiator, the **RESOLUTION TEST** will present unreliable readings. The gain of the incoming analog signals is under control of the Tester. In this manner a wide range of input signals can be accommodated (50 mV. to 1.8 Volts). These probes are used for all Tests in the **ALIGN** Row that require sampling the analog signals from the media. For dual channel applications, an additional set of ***YELLOW TWISTED PAIR*** probes are provided to capture the signals for Head 1. The switch under the **ANALOG RECEIVER** is used to switch between single channel (drive switches analog) and dual channel (Tester switches analog) modes.

PHASE A

This **RED** probe is used for two Tests. During the **PRELIMINARY TRACK ALIGN**, this probe is used to monitor Phase A of the positioning motor. During this Test, this probe should be connected to the output driver for Phase A of the step motor. When making the **PRELIMINARY TRACK ALIGN** adjustment, this probe is used to assure that Phase A of the step motor is in coincidence when the Track 00 track of the alignment diskette is found. During this Test, the **PHASE A** indicator in the Status Row is used to monitor the activity of this signal. Most newer drives styles have automatic circuitry that forces this condition and may not require this connection. Please refer to the particular drive electronics for details. The other application for this probe is during the **TRACK 00 SENSOR ADJUST**. For this Test, the Red probe is connected to the Track 00 sensor before it is gated with Phase A of the step motor. In most cases, the probe can be connected directly to the sensor output. This adjustment is made so that the Track 00 sensor changes state prior to Phase A of the motor system being activated. Please refer to the drive schematics for the appropriate test point.

INDEX IN/OUT

This ***BLUE*** and ***YELLOW*** set of probes are used for Index to Data testing for certain classes of double sided 8" drives. These drives have circuitry that prevents the top head Index signal from the interface connector. In these cases, the probes are used to connect to the top head Index prior to entering this prevent logic (**INDEX IN/BLUE**) and the other probe (**INDEX OUT/YELLOW**) is used to connect to the Index signal on the interface connector. In this manner, both Index signals will be at the interface so that the top head Index to Data measurement may be made. A slide switch is provided on the bottom of the **ANALOG RECEIVER** to change the polarity of this signal in cases where the correct polarity (low true) cannot be found. For dual channel applications, these probes are replaced with an additional ***YELLOW TWISTED PAIR*** for connection to Head 1 analog signals. The switch under the **ANALOG RECEIVER** is now used to select between single and dual channel modes.

GROUND

This **BLACK** probe is used for attaching to logic ground. In most cases this probe is not required. Please refer to the drive schematics for grounding requirements.

INTRODUCTION

This option expands the utilization range of the Tester by providing the ability to test and measure the analog performance of the drive, including mechanical stability and alignment. **OPTION R** provides fully automatic time base, signal gain and peak detection filter controls, and are adjusted by the Tester for each Test. The cluster of tests and measurements provided with this option are:

PERFORMANCE	ALIGNMENT
ECCENTRICITY/COMPLIANCE	PRELIMINARY TRACK ALIGN
HEAD LOAD SETTLE	STATIC TRACK ALIGN
HEAD STEP SETTLE	OPTALIGN/HYSTERESIS
HEAD RESOLUTION	INDEX TO DATA
MOTOR START TIME	AZIMUTH
HEAD AMPLITUDE	TRACK 00 SENSOR ADJUST
SELF ERASE	MULTITRACK ALIGN
MODULATION	AUTO ALIGN

The analog tests and measurements incorporated are of two types: those that measure the analog performance of the critical components (i.e. **AMPLITUDE, RESOLUTION**) and those for mechanical adjustment. When using the **INTELLIGENT SERIES** alignment diskette, both types of measurements can be performed. When using traditional ***cateye*** alignment diskettes, only the mechanical adjustments can be performed, requiring a data diskette for analog performance testing, thereby slowing the process of measurement. The Tester is equipped to measure using either measuring technique as described below.

SWITCHING BETWEEN ALIGNMENT DISKETTE TYPES

The Tester supports the ability to test and measure both the ***cateye*** and **INTELLIGENT SERIES** alignment diskettes. The measurements that can be performed are **STATIC TRACK ALIGN, OPTALIGN/HYSTERESIS,** and **AZIMUTH**. All other Tests operate in the same manner regardless of the diskette. The Tester includes a Modifiable Parameter named **ALIGN MODE** and is included for each **TEST TABLE**, and is also available via the **RAM** function. Refer to the **CONFIGURATION WORKSHEET AND PROGRAMMING INSTRUCTIONS** for the appropriate memory locations. When set to **00 HEX**, the Tester begins these Tests in the ***cateye*** mode. If set to **01 HEX**, the Tester begins these Tests in the **INTELLIGENT SERIES** mode. When set to **02 HEX**, the Tests begin in the **Sony Model RZW406D** Mode.

The Tester includes the **STATUS** Row function **INTELLIGENT SERIES ON**. When **ON**, measurements are made in the **INTELLIGENT SERIES** Mode. When **OFF**, measurements are made in the ***cateye*** Mode.

For added convenience and simplified distribution/correlation, the Tester can also switch between the **INTELLIGENT SERIES** and ***cateye*** diskettes while these Tests are operating. Depress Key **C** while either **STATIC TRACK ALIGN, OPTALIGN/HYSTERESIS,** or **AZIMUTH** are operating and the Tester switches between the current Mode to the other Modes as follows. ***Please note that the ALIGN MODE must match the diskette type being measured to get accurate results.***

INTELLIGENT SERIES - Begin in this mode and **CONVERT** to ***traditional cateye*** mode.

TRADITIONAL CATEYE - Begin in this mode and **CONVERT** to **INTELLIGENT SERIES** mode.

SONY ED CATEYE - Begin in this mode and **CONVERT** to **INTELLIGENT SERIES** mode.

As noted above, the Tester also measures the ***Sony Model RZW406D*** ED Media alignment diskette when the **ALIGN MODE** Parameter is set to **02 HEX** and is to be used with 4MB drives supporting ED Media. For this diskette, alignment information is presented in **%** and Azimuth is presented in ***minutes***. When in this Mode, Key **C** switches between this diskette and the **INTELLIGENT SERIES**, so that distribution/correlation capabilities are sustained.

Because many Tests performed in this Row are associated with operator adjustments, the Printer is preset to the **OFF** position. In this manner, Display information is updated at the fastest rate for most convenience during adjustments. The final measurement is printed when the operator exits a Test. If continuous printing is desired, depress **PRINT ON/OFF** (Key **B**) once the Test starts.

FEATURE/BENEFIT

FEATURE	BENEFIT
AUTO CORRECTION	This feature allows the Tester to concurrently measure and correct for the effects of Modulation/Eccentricity while performing alignment measurements, significantly increasing accuracy by correcting for these external phenomena.
HUMIDITY CORRECTION	Maintains the original precision of the diskette due to humidity changes of the measuring environment.
MULTIPLE AZIMUTH	Significantly extends the range and accuracy of measurement. The information is presented directly in minutes and updated every revolution of the diskette.
BOTH HEADS	The Tester interrogates and presents the alignment information for both heads, providing the head separation information concurrently for Track Align, Azimuth and Index to Data. This is beyond the ability of scope/exerciser capabilities.
DIRECTORY	In conjunction with the Tester, using the diskette beyond the accurate life of the diskette is avoided, improving overall accuracy.
DIRECT MEASUREMENTS	The units of measurement are direct and absolute (Track Align in ***micrometers***, Azimuth angle in ***minutes*** and Index to Data in ***microseconds***).

SPECIFICATIONS

TRACK ALIGNMENT

STYLE: MULTIPLE PULSE - NON ECCENTRIC

ACCURACY:
5 1/4" = +/- 5uM
3 1/2" = +/- 3uM

REPEATABILITY: +/- 1uM

HUMIDITY CORRECTION: IN 1% INCREMENTS (VIA TESTER)

CORRELATION ENVIRONMENT: HUMIDITY: 50% RH, +/- 2% . TEMPERATURE: 70° F, +/- 2°

NUMBER OF SAMPLES (PER REVOLUTION)

TYPE	RPM	SAMPLES
5 1/4"	300	162
5 1/4"	360	156
5 1/4"	600	120
5 1/4"	180	162
3 1/2"	300	156
3 1/2"	360	156
3 1/2"	600	120
3 1/2"	VAR	138

TRACKS:

DRIVE TYPE	SINGLE TRACK	MULTI TRACK
5 1/4", 48TPI	16	5,12,16,21,26,30,37
5 1/4", 96TPI	32	6,12,20,26,32,40,48,54,60,66,72,76
3 1/2", 135TPI	40	5,12,19,26,33,40,47,54,61,68,77

AZIMUTH ANGLE

PATTERN STYLE: TRIPLE ANGLE SET

SENSE ACCURACY: +/- 2'

REPEATABILITY: +/- 0.1'

SETS PER GROUP: 2

GROUPS PER TRACK, SENSE RANGE, AND TEST TRACK

TYPE	RPM	TPI	DATA RATE	SAMPLES	RANGE	TRACK
5 1/4"	300	48	250 KBS	126	29'	34
5 1/4"	600	48	500 KBS	108	29'	34
5 1/4"	300	96	250 KBS	126	35'	68
5 1/4"	360	96	500 KBS	126	27'	68
5 1/4"	600	96	500 KBS	108	26'	68
5 1/4"	720	96	1000 KBS	156	21'	68
5 1/4"	180	96	500 KBS	132	26'	68
3 1/2"	300	135	250 KBS	156	46'	40
3 1/2"	300	135	500 KBS	156	30'	40
3 1/2"	360	135	500 KBS	156	46'	40
3 1/2"	600	135	500 KBS	120	45'	40
3 1/2"	VAR	135	500 KBS	138	45'	40
3 1/2"	300	135	1000 KBS	156	26'	40
3 1/2"	600	135	1000 KBS	120	29'	40

INDEX TO DATA

PATTERN STYLE: LOW FREQUENCY BURST

BURSTS PER SURFACE: 3

MEASURING RANGE: 0 uS TO +999 uS

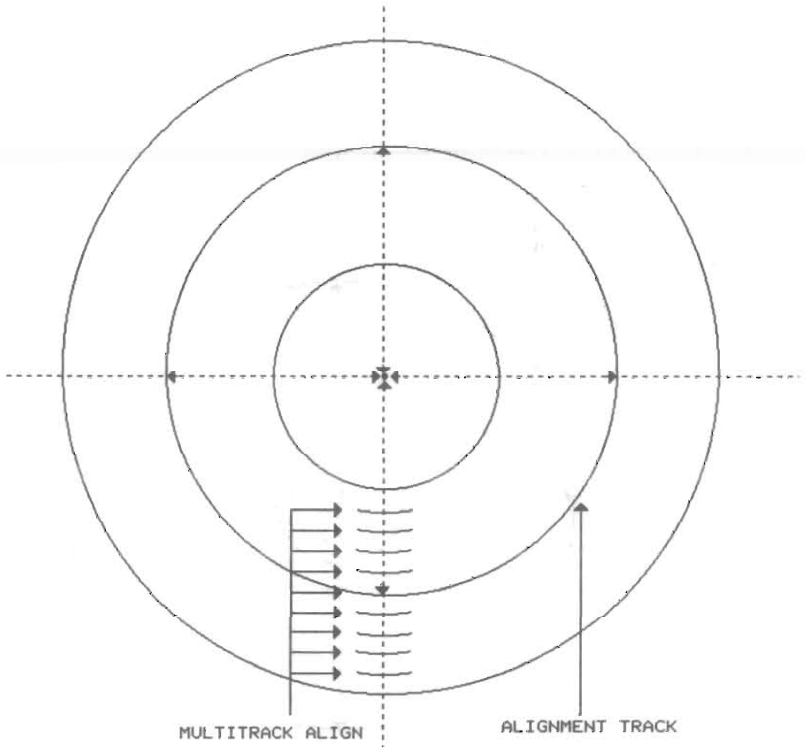
ACCURACY: +/- 50 uS

REPEATABILITY: +/- 1 uS

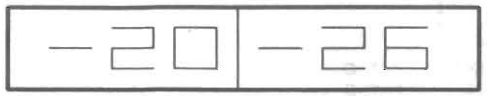
PATTERN LOCATION:
5 1/4", 48 TPI = TRACKS 1, 16 AND 34
5 1/4", 96 TPI = TRACKS 2, 32 AND 68
3 1/2", 135 TPI = TRACKS 2, 40 AND 69

TRACK ALIGN/OPTALIGN INFORMATION

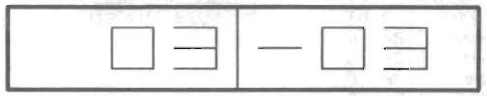
MEDIA LAYOUT



EXAMPLE TESTER DISPLAY READINGS



POOR ALIGNMENT



CORRECT ALIGNMENT BALANCE
TYPICAL HEAD SEPARATION
TOTAL = 6 uM

CORRECT ALIGNMENT BALANCE
EXCESSIVE HEAD SEPARATION
TOTAL = 54 uM

SPECIFICATIONS

TRACK LOCATIONS:	DRIVE STYLE	SINGLE TRACK	MULTITRACK
	5 1/4" - 48 TPI	16	5,12,16,21,26,30,37
	5 1/4" - 96 TPI	32	6,12,20,26,32,40,48,54,60,66,72,76
	3 1/2" - 135 TPI	40	5,12,19,26,33,40,47,54,61,68,77

SAMPLES PER REVOLUTION:
- 5 1/4", 300 RPM = 162
- 5 1/4", 360 RPM = 156
- 5 1/4", 600 RPM = 120
- 3 1/2", 300 RPM = 156
- 3 1/2", 360 RPM = 156
- 3 1/2", 600 RPM = 120
- 3 1/2", VARIABLE= 138

ACCURACY:
- 5 1/4" = +/- 5uM
- 3 1/2" = +/- 3uM

REPEATABILITY: +/- 1uM
DISPLAY READINGS: IN 1uM INCREMENTS
HUMIDITY CORRECTION: IN 1% INCREMENTS

FIGURE 2

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TRACK ALIGN/OPTALIGN

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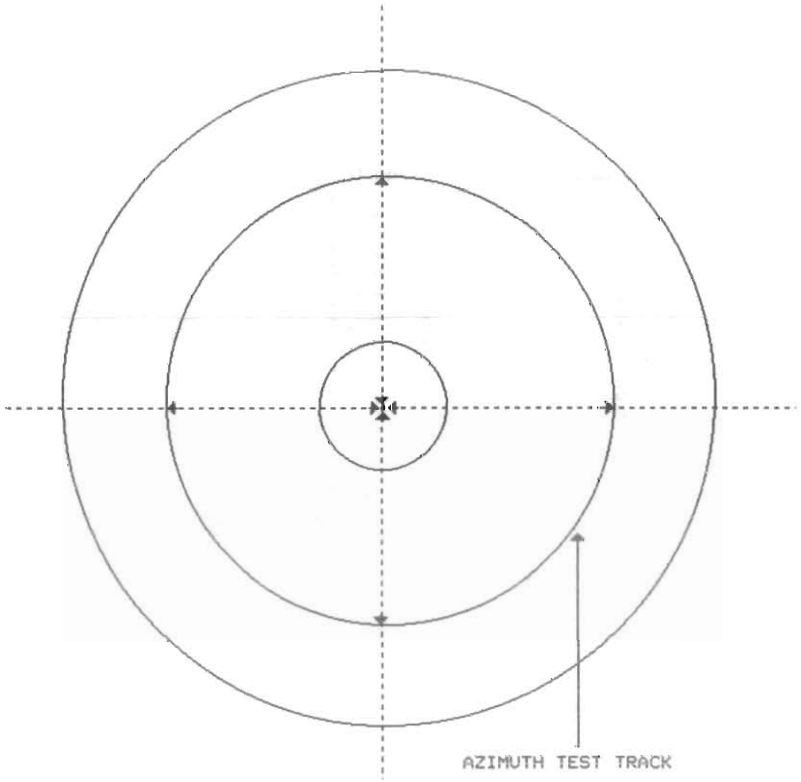
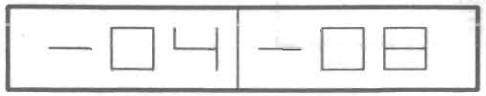
AZIMUTH INFORMATION

MEDIA LAYOUT



EXAMPLE TESTER DISPLY READINGS

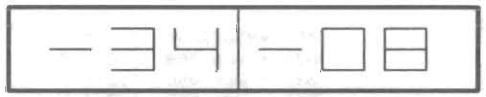


NORMAL AZIMUTH ERROR

VALUES DIRECTLY IN MINUTES OF ARC ERROR

MINUS VALUES ARE COUNTERCLOCKWISE

PLUS VALUES ARE CLOCKWISE



EXCESSIVE AZIMUTH ERROR

SPECIFICATIONS

AZIMUTH STYLE:	TRIPLE ANGLE SET
SETS PER GROUP:	2
GROUPS/SAMPLES PER TRACK:	5 1/4", 300 RPM = 63/126
	5 1/4", 360 RPM = 63/126
	5 1/4", 600 RPM = 54/108
	3 1/2", 300 RPM = 78/156
	3 1/2", 360 RPM = 78/156
	3 1/2", 600 RPM = 60/120
	3 1/2", VARIABLE = 69/138

SENSE RANGE:

DRIVE STYLE/DATA RATE (KBS)	RANGE
5 1/4", 300 RPM, 48 TPI/250	29'
5 1/4", 600 RPM, 48 TPI/500	29'
5 1/4", 300 RPM, 96 TPI/250	35'
5 1/4", 360 RPM, 96 TPI/500	27'
5 1/4", 600 RPM, 96 TPI/500	26'
3 1/2", 300 RPM, 135 TPI/250	46'
3 1/2", 300 RPM, 135 TPI/500	30'
3 1/2", 360 RPM, 135 TPI/500	46'
3 1/2", 600 RPM, 135 TPI/500	45'
3 1/2", VARIABLE, 135 TPI/500	45'
3 1/2", 300 RPM, 135 TPI/1000	26'
3 1/2", 600 RPM, 135 TPI/1000	29'

DISPLAY READING:	IN 0.1 MINUTE INCREMENTS
SENSE ACCURACY:	+/- 2 MINUTES
REPEATABILITY:	+/- 1 MINUTE
TRACK LOCATIONS:	5 1/4", 48 TPI = 34
	5 1/4", 96 TPI = 68
	3 1/2", 135 TPI = 40

FIGURE 3

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AZIMUTH

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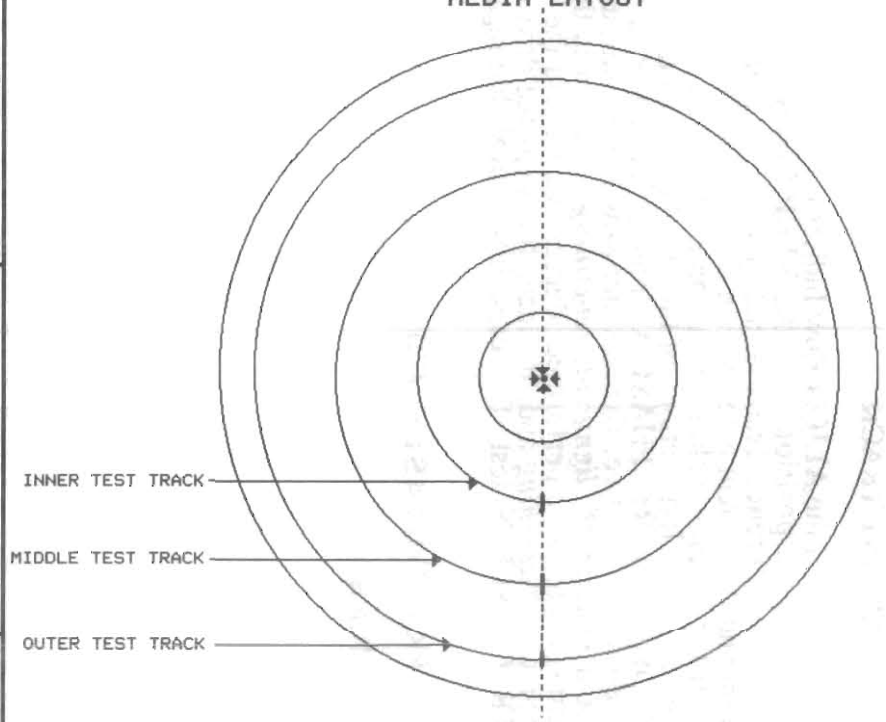
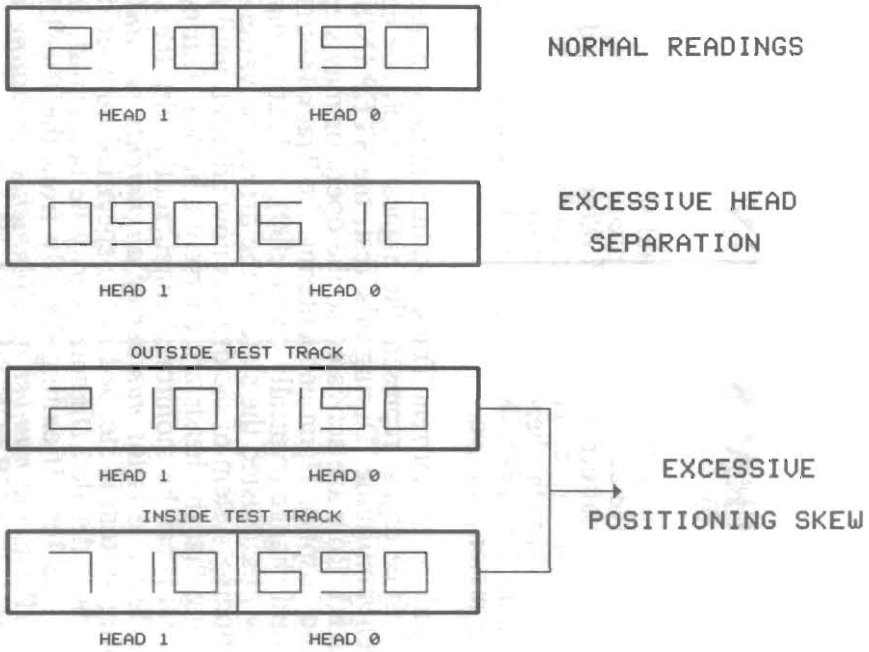
INDEX TO DATA INFORMATION

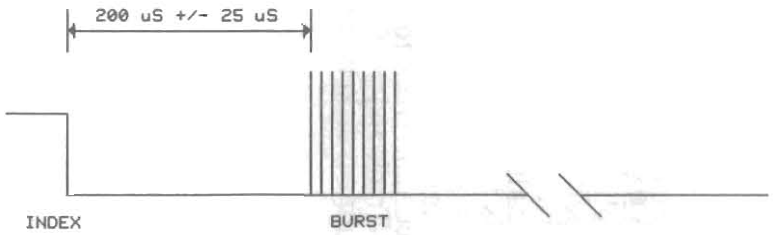
MEDIA LAYOUT



EXAMPLE TESTER DISPLAY READINGS



TIMING



SPECIFICATIONS

NUMBER OF BURSTS:	3 PER HEAD
LOCATION FROM INDEX:	200 MICROSECONDS
ACCURACY:	+/- 50 MICROSECONDS
REPEATABILITY:	+/- 1 MICROSECOND
TRACK LOCATIONS:	5 1/4", 48 TPI = 1/16/34 5 1/4", 96 TPI = 2/32/68 3 1/2", 135 TPI = 2/40/69

FIGURE 4

BRIAN INSTRUMENTS, INC.

INDEX TO DATA

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PRELIMINARY TRACK ALIGN
(KEY 0)

This function is used during initial head alignment. The purpose is to establish a known track reference and step motor phasing prior to making the detailed drive alignment at the precision alignment Track (See **FIGURE 5**). The alignment diskette has a reference pattern on the ***Track 00*** track of the diskette. This pattern is used to establish the coarse alignment of the drive. The object is to "scan" the head across the Track to find the maximum amplitude, and then adjust the head alignment to come as close to the peak amplitude as possible. In conjunction with this, the Red **PHASE A** probe of the **ANALOG RECEIVER** is used to verify that ***Phase A*** of the positioning motor is active.

The Tester begins by reading the signal amplitude at the current Track location (approximately Track 3) and the Display presents two readings. The left three digits represent the highest amplitude detected thus far. The right three digits represent the current amplitude. During this Test, the **STEP IN/STEP OUT** (Keys **0/1**) functions located in the **AUXILIARY** Row are activated so the operator may step the heads toward the Track 00 track while monitoring the Display. Upon encountering the Track 00 track, the left section of the Display makes a noticeable upward change (typically above **500**), indicating that the reference Track has been found. Depending on how misadjusted the state of the drive, the value in the right section of the Display may be lower. The positioning system of the drive is now adjusted until the left and right sections of the Display are equal, indicating that the heads are coarsely adjusted. During this Test, the **STATUS** Row is active so that Interface Status can be monitored concurrently with the adjustment. The operator may now depress Key **2** and the Tester tests for ***number of alignments remaining***. If successful (Heads are on Track 00) the positioning system is stepped in the specified number of tracks to perform the **STATIC TRACK ALIGN** Test, where detailed alignments may be performed. If not, or at the conclusion, depressing any Row Key exits the Test. If exiting directly from the **PRELIMINARY ALIGN** Test, the Tester automatically Displays/Prints the ***number of alignments remaining*** if Track 00 has been achieved. If the Heads are not on Track 00, a **TRACK 00 ERROR** message is reported. The above procedure may be performed using a ***cateye*** diskette, except the ***number of aligns remaining*** is not performed.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

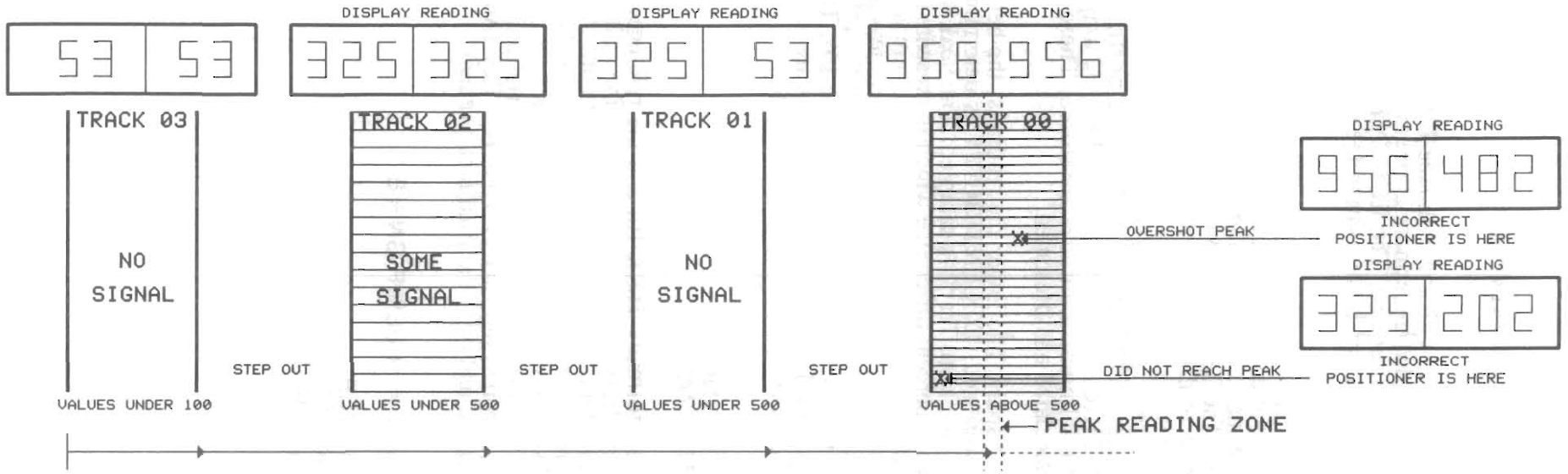
Depress Key **0**. The Status Row Indicator remains **ON** and the **ALIGN** Row Indicator is also **ON**. Amplitude readings automatically begin at the current Track position. Use the **STEP IN/OUT** functions (**AUXILIARY** Row, Keys **0/1**) to "search" for the reference Track signal. The Display presents the highest amplitude encountered in the ***left*** section and the current amplitude in the ***right*** section. Once the reference pattern is detected, the left section of the Display makes a noticeable upward change (above **500**). Adjust the positioning system so that the right and left sections of the Display are ***equal***. At this point the heads are positioned over ***Track 00***. Connect the Red **PHASE A** Probe to the test point on the drive that is high true when Phase A of the step motor is active. Depress any Row Key to exit, and the Display/Printer outputs the final information and ***number of alignments remaining*** as shown in the following example. If detailed alignment adjustments are to be performed, depress Key **2** and the Tester reads the current Track for the ***number of alignments remaining*** and, if successful, steps the drive to the alignment Track and performs the **STATIC TRACK ALIGN** Test. This capability is available regardless of the alignment diskette type being used.

P PRELIM TRK PK= 775 LAST= 770

 # ALIGNS: 75

PRELIMINARY ALIGNMENT

PHYSICAL REPRESENTATION



APPROACH THIS DIRECTION.....FIND PEAK.....ADJUST FOR MAX READING

AMPLITUDE REPRESENTATION

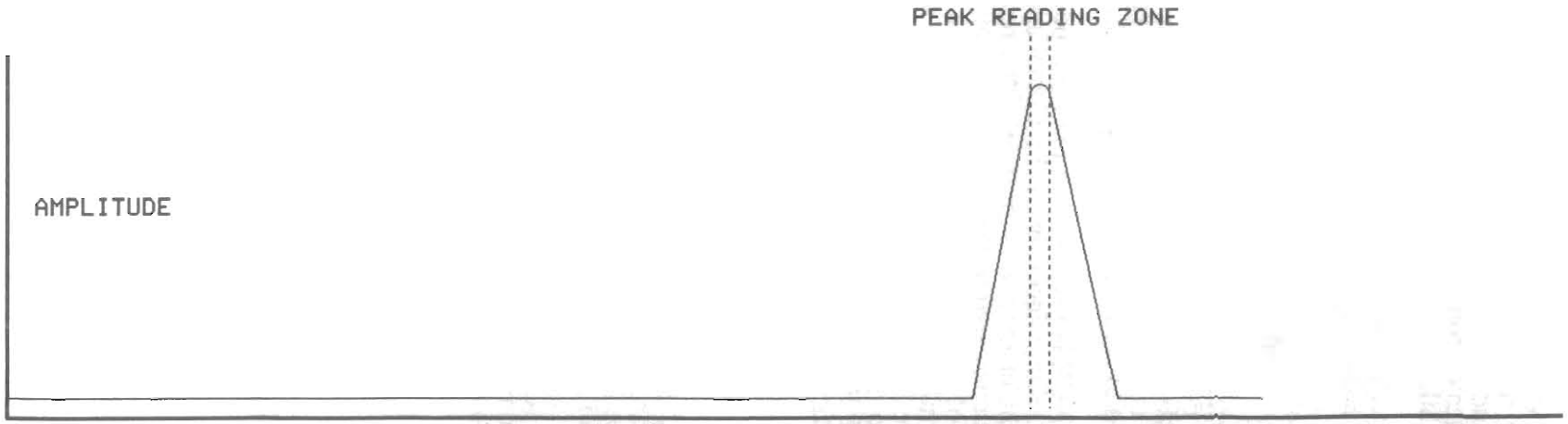


FIGURE 5

BRIAN INSTRUMENTS, INC.

PRELIMINARY TRACK ALIGN

D | BRIKON/QUICKLIGN | REV: A

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ECCENTRICITY/COMPLIANCE
(KEY 1)

COMPLIANCE is a measure of how well the head is in contact with the disk (see **FIGURE 6**). It is measured by comparing the signal amplitude when the head is loaded under normal pressure to the amplitude when under greater pressure. Ideally there should be little difference. The **ECCENTRICITY** measurement indicates how concentric the disk rotation/clamping system is, by measuring the cyclic changes in amplitude while reading a test Track.

COMPLIANCE/ECCENTRICITY is a two step measurement in that the Tester does not perform the "head under heavy pressure" portion until the operator has installed the weight and depressed the **ENTER** Key to complete the Test. The read signal amplitude is first measured when under normal load force and *then measured under* high force (weight attached to head). The Tester presents the difference in the two readings expressed in ***percent***. A significant difference in readings means that the head load force is incorrect. To accomplish this, the drive seeks to the test Track, takes amplitude reference readings around the Track, presents it to the Display and halts, waiting for the operator to install the weight and depress **ENTER** to complete the Test. The Tester completes the **COMPLIANCE** Test and performs the **ECCENTRICITY** Test simultaneously. In the **ECCENTRICITY** portion of the Test, ***32*** amplitude samples are taken around the Track. Peak maximum and minimum amplitudes are stored. These values are compared to each other and the percent difference is calculated and presented.

COMPLIANCE is presented in the ***right*** portion of the Display. The lower the readings, the better the Compliance. Simultaneously as the Compliance is being presented, **ECCENTRICITY** is determined by measuring the change in amplitude of the read signals as the entire Track is sampled. The peak to peak difference is compared to the maximum amplitude to obtain a percent difference which is presented in the ***left*** section of the Display. Because the Test is ***read continuously***, the Test media can be removed and reinserted while the Test is operating, so that media clamping variations can be observed and measured. If this Test is to be performed on a data diskette, it is first necessary to prepare the Track with the reference signal. To do this, go to the **CONTROL** Row and Seek to the intended test Track (preset to **10**). Then go to the **TEST** Row and perform **WRITE 2F** on the intended test Track. Both measurements are presented as a percentage change, so that the Tests can be performed on a comparative or intrinsic basis.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

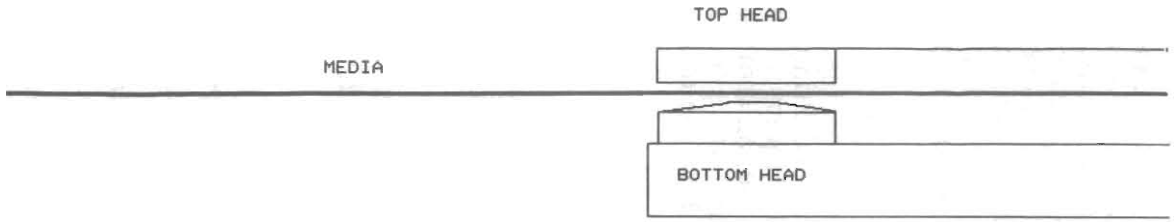
Depress Key **1**. The heads are positioned to the test Track (normally Track 10) and the reference signal is sampled around the Track. The Display presents a three digit value in the right section. This value should exceed **300**. If **COMPLIANCE** is to be measured, install the prescribed weight onto the head. Depress **ENTER** to perform the calculation. The value in the right section of the Display is the **COMPLIANCE** value. The lower the value, the better the Compliance. The value in the left section is the **ECCENTRICITY** value. By removing and reinstalling the test diskette, clamping variations can be separated from media Modulation. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

P COMPLI = +08%P ECCENTR = +06%P GN=5

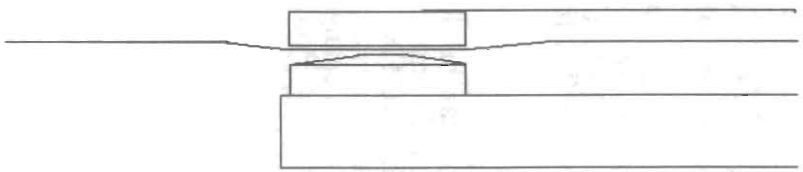
COMPLI = COMPLIANCE
ECCENTR = ECCENTRICITY
GN = GAIN SETTING OF AGC

COMPLIANCE

CORRECT



INCORRECT



INCORRECT

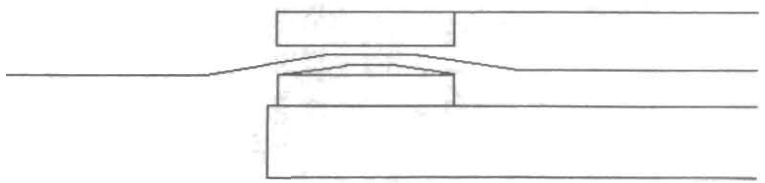


FIGURE 6

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BRIAN INSTRUMENTS, INC.

COMPLIANCE

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STATIC TRACK ALIGN
(KEY 2)

This Test is used to perform the precision radial alignment measurement of the drive positioning system (see **FIGURE 7**). Because the alignment error and direction (a minus error is toward Track 00) for each Head is presented separately, ***Head Separation*** is determined directly.

To provide the greatest precision, the Tester, in conjunction with the **INTELLIGENT SERIES** alignment diskette, performs automatic correction for **ECCENTRICITY** and **MODULATION**. In this manner, the alignment measurements are corrected, removing these unwanted variables. In addition, corrections for Humidity are also made via the **ENTER HUMIDITY** function (**CONFIGURATION** Row, Key **9**). These automatic corrections are not available when used in a ***cateye*** Mode. When in a ***cateye*** Mode, the Display presents correction values for each Head for the operator to insert if the correction factors for the diskette are known. Use **SIGN CHANGE +/-** (**AUXILIARY** Row, Key **F**) to insert the proper correction direction. These correction factors are also applied when performing the **OPTALIGN/HYSTERESIS** Test. When in the **INTELLIGENT SERIES** Mode, the measurements are in ***micrometers***, with a resolution of ***1uM***. When in a ***cateye*** Mode, the values are in ***percent***, with an uncorrected resolution of ***1%***. Because the error and direction of each Head is presented simultaneously, the positioning system can be adjusted to achieve balance over the error between the top and bottom Heads by adjusting the positioning system so that the values in the Display are equal, but opposite polarity. In this manner the effective error is reduced to the smallest error possible. The Display is updated every revolution, providing a practical and efficient means of adjustment.

When in the **INTELLIGENT SERIES** Mode, the Tester first interrogates the diskette automatically to verify the **NUMBER OF ALIGNS REMAINING** is greater than ***0*** before proceeding to the test Track for measurement. If ***0***, the Test aborts, presenting a message to the Display and Printer, indicating no more alignments remain and another diskette should be used. The Tester is also equipped with error traps, should an improper diskette type be used for the drive being tested. In this case, an error message is also presented, notifying the operator a conflict exists between the diskette and drive type. The Display presents the **TEST TABLE** selected in the left section and the **TEST TABLE** of the diskette in the right section. The Printer outputs the following example.

F PARAM:04 DISK:05

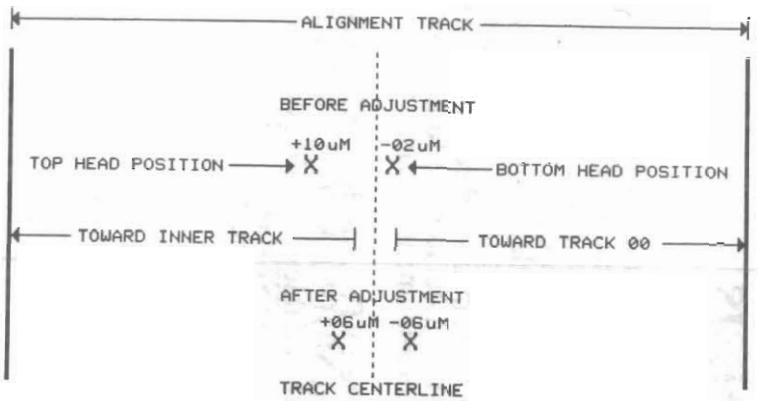
Once the Test starts, depressing **ALIGN TOGGLE** (**AUXILIARY** Row, Key **3**), toggles the measurement between **STATIC TRACK ALIGN** and **OPTALIGN/HYSTERESIS** with each depression of the Key (***please NOTE***; when alternating from **OPTALIGN** to **STATIC TRACK ALIGN**, the Tester uses the currently set offtrack value. If a different offtrack value is desired, start the **OPTALIGN** Test first).

Each **TEST TABLE** is equipped with an **ALIGN MODE** Parameter and is used to preset the measurement style. When set to **00**, the Tester begins measurements in the ***cateye*** Mode. When set to **01**, the Tester begins measurements in the **INTELLIGENT SERIES** Mode. When set to **02**, the Tester begins measurements in the **Sony Model RZW406D** Mode.

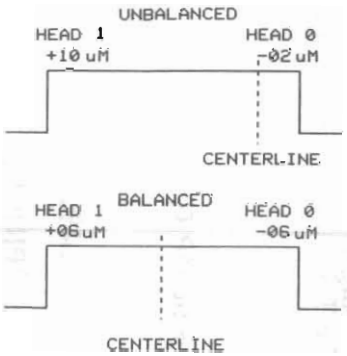
For convenience, the Tester provides a feature that allows the Tester to measure both commercial ***cateye*** and **INTELLIGENT SERIES** alignment diskettes while the Test remains active. In this manner, convenient distribution and correlation can be determined. To accomplish this, once the Test starts, depress **CHANGE ALIGN TYPE** (Key **C**) and then insert the other type diskette. The Tester changes analog sampling Mode between **INTELLIGENT SERIES** and ***cateye*** style diskettes. For maximum convenience, the Tester provides separate pass/fail limits for **INTELLIGENT SERIES** and ***cateye*** measurements. Whenever the Align Mode is changed, the appropriate pass/fail parameter and nomenclature (uM or %) are presented by the Tester and Printer. Because there is no method to correct for **ECCENTRICITY, MODULATION** or **HUMIDITY** in ***cateye*** diskettes, the values presented are uncorrected and should be taken into consideration when correlating. Each depression of Key **C** alternates the measurement technique between these two types. Depress any Row Key to exit and print the final measurement.

STATIC TRACK ALIGN

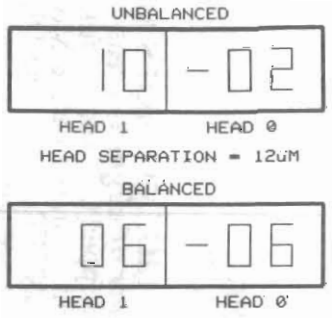
PHYSICAL



GRAPHIC

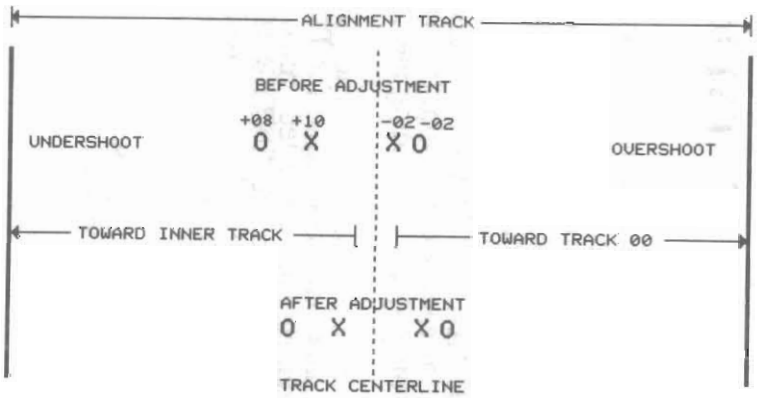


TESTER DISPLAY READING

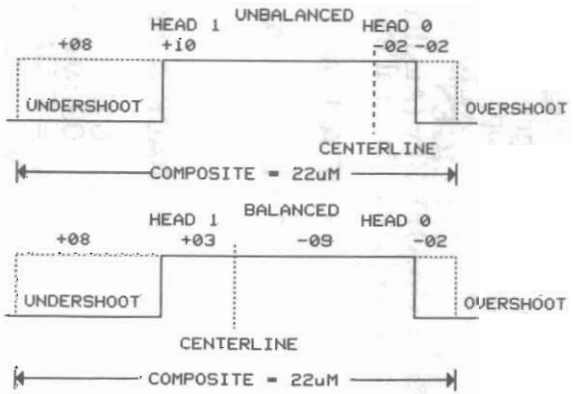


OPTALIGN

PHYSICAL



GRAPHIC



TESTER DISPLAY READING

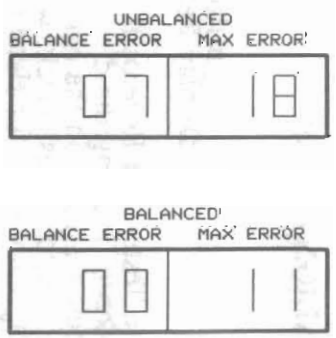


FIGURE 7

BRIAN INSTRUMENTS, INC.

STATIC TRACK ALIGN/OPTALIGN

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STATIC TRACK ALIGN (Cont'd)

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **2**. The Tester first Rezeros the drive. If in the **INTELLIGENT SERIES** Mode, the Tester interrogates the diskette, locating the directory to verify the ***number of aligns*** is greater than **0** and the proper diskette is being used (if in the ***cateye*** Mode, this step is skipped). If successful, the Heads are automatically positioned to the test Track, where measurements begin. If in the ***cateye*** Mode, the Display blinks the correction factor value for Head 0. Insert the value and **ENTER**, where the Display blinks the correction value for Head 1. Insert the value and **ENTER**. The Heads are then positioned to the alignment Track where measurements begin. The left section of the Display presents the value of misalignment (in ***uM*** or **%**) and direction of the misalignment for Head 1. The right section of the Display presents the value and direction of the misalignment of Head O. The positioning system may now be adjusted for the desired alignment (equal values; opposite polarity). Depressing the **ALIGN TOGGLE** (Key **2**) causes the Test to change between **STATIC ALIGN** and **OPTALIGN**. Depressing **CHANGE ALIGN TYPE** (Key **C**) changes between **INTELLIGENT SERIES** and ***cateye*** measuring style. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit. The printer always prints the final measurement.

 # OF ALIGNS: 075

P NEW TRK ALI 0:+07uMP G4 1:+9uMP G4

OR

P TRACK ALIGN SN006 0:+11%P 1:+14%P

0:+07uMP = 7uM ERROR TOWARD SPINDLE
1:+09uMP = 9uM ERROR TOWARD SPINDLE
G4 = GAIN SETTING OF A.G.C.
S/N = SIGNAL TO NOISE VALUE

OPTALIGN/HYSTERESIS
(KEY 3)

The **OPTALIGN** Test is used to measure the effect of the dynamic characteristics of the positioning system to drive alignment (see **FIGURE 7**). The positioning systems of most drive designs have inherent overshoot, undershoot and hysteresis (the inability to stop at the same location when approached from both directions). This, in turn, adds error to the positioning system not detectable during static alignment conditions. In addition to this, the "overshoot" may be greater than the "undershoot" or vice-versa. When this occurs, an alignment imbalance is generated that distorts the static alignment. To measure this error and effect, the **OPTALIGN** Test approaches the alignment Track from both directions measuring the alignment errors for each Head. From this information, the Tester calculates the total error due to the heads and positioning system, including the center, where optimum alignment occurs.

To provide the greatest precision, the Tester, in conjunction with the **INTELLIGENT SERIES**, alignment diskette performs automatic correction for **ECCENTRICITY** and **MODULATION**. In this manner, the alignment measurements are corrected, removing these unwanted variables. In addition, corrections for Humidity are also made via the **ENTER HUMIDITY** function (**CONFIGURATION** Row, Key **9**). These corrections are not available when used in a ***cateye*** Mode. When in the **INTELLIGENT SERIES** Mode, the measurements are in ***micrometers***, with a resolution of ***1uM***. When in a ***cateye*** Mode, the values are in ***percent***, with an uncorrected resolution of 1%.

The left section of the Display presents the net error of alignment compared to the calculated centerline. Optimum alignment occurs when this value is **0**. The value in the right section of the Display is the largest alignment error value. When the value in the left is **0**, the value in the right is the lowest possible with the existing position repeatability/Hysteresis and Head Separation characteristics.

OPTALIGN/HYSTERESIS (Cont'd)

Each **TEST TABLE** is equipped with an **ALIGN MODE** Parameter and is used to preset the measurement style. When set to **00**, the Tester begins measurements in the ***cateye*** Mode. When set to **01**, the Tester begins measurements in the **INTELLIGENT SERIES** Mode. When set to **02**, the Tester begins measurements in the **Sony Model RZW406D** Mode.

For convenience, the Tester provides a feature that allows the Tester to measure both commercial ***cateye*** and **INTELLIGENT SERIES** alignment diskettes while the Test remains active. In this manner, convenient distribution and correlation can be determined. To accomplish this, once the Test starts, depress **CHANGE ALIGN TYPE** (Key **C**) and then insert the other type diskette. The Tester changes analog sampling Mode between **INTELLIGENT SERIES** and ***cateye*** style diskettes. For maximum convenience, the Tester provides separate pass/fail limits for **INTELLIGENT SERIES** and ***cateye*** measurements. Whenever the Align Mode is changed, the appropriate pass/fail parameter and nomenclature (uM or %) are presented by the Tester and Printer. Because there is no method to correct for **ECCENTRICITY, MODULATION** or **HUMIDITY** in ***cateye*** diskettes, the values presented are uncorrected and should be taken into consideration when correlating. If in the ***cateye*** Mode, the correction factors inserted in the **STATIC TRACK ALIGN** Test are used. Each depression of Key **C** alternates the measurement technique between these two types. Depress any Row Key to exit and print the final measurement.

When in the **INTELLIGENT SERIES** Mode, the Tester first interrogates the diskette automatically to verify the **NUMBER OF ALIGNS REMAINING** is greater than ***0*** before proceeding to the test Track for measurement (if in the ***cateye*** Mode, this step is skipped). If ***0***, the Test aborts, presenting a message to the Display and Printer, indicating no more alignments remain and another diskette should be used. If successful, the ***number of aligns*** is Displayed and Printed. The Display blinks the ***track offset*** value (normally set to **5**). In this case, the Heads are stepped **5** tracks to either side of the alignment Track. The Tester is also equipped with error traps, should an improper diskette type be used for the drive being tested. An error message is also presented, notifying the operator a conflict exists between the diskette and drive type. The Display presents the **TEST TABLE** selected in the left section and the **TEST TABLE** of the diskette in the right section. The Printer outputs the following example.

F PARAM:04 DISK:05

Once the Test starts, depressing **ALIGN TOGGLE** (**AUXILIARY** Row, Key **3**), toggles the measurement between **STATIC TRACK ALIGN** and **OPTALIGN/HYSTERESIS** with each depression of the Key (***please NOTE***; when alternating from **OPTALIGN** to **STATIC TRACK ALIGN**, the Tester uses the currently set offtrack value. If a different offtrack value is desired, start the **OPTALIGN** Test first).

For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test has started. Depress any Row Key to exit and print the final measurement.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **3**. If in the **INTELLIGENT SERIES** Mode, the Tester first interrogates the diskette, locating the directory to verify the ***number of aligns*** is greater than **0** and the proper diskette is being used (if in the ***cateye*** Mode, this step is skipped). If successful, the Display blinks the ***track offset*** value. Depress the **ENTER** Key and the Heads are positioned and measurements begin.

The left section of the Display presents the net error of alignment compared to the calculated centerline. Optimum alignment occurs when this value is **0**. The value in the right section of the Display is the largest alignment error value. When the value in the left is **0**, the value in the right is the lowest possible with the existing position repeatability/Hysteresis and Head Separation characteristics. Some caution needs to be exercised when making adjustments during this Test, because the Display is updated at a slower rate, due to the positioning times involved, causing a delay between hand motion and Display update.

OPTALIGN/HYSTERESIS (Cont'd)

Depressing the **ALIGN TOGGLE** (Key **2**) causes the Test to change between **STATIC ALIGN** and **OPTALIGN**. Depressing **CHANGE ALIGN TYPE** (Key **C**) changes between **INTELLIGENT SERIES** and ***cateye*** measuring style. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit. The printer always prints the final measurement.

BEFORE OPTIMIZATION

P NHY uM +07P 0> -02P < +10P 1> -04P < +18P*

AFTER OPTIMIZATION

P NHY uM +00P 0> -09P < +03P 1> +03P < +11P*

PRINTER DETAIL

+07P	=	Error from optimal positioning.
0> -02P	=	Hd 0 error, lo track to hi track.
< +10P	=	Hd 0 error, hi track to lo track.
1> -04P	=	Hd 1 error, lo track to hi track.
< +18P	=	Hd 1 error, hi track to lo track. * = highest reading

INDEX TO DATA

(KEY 4)

This Test measures the number of ***microseconds*** between the ***Index Sensor*** and the ***Magnetic Index Mark*** that is located on the alignment diskette (See **FIGURE 8**). The Tester has the ability to test up to three Tracks (most ***cateye*** diskettes provide only an outer and inner test Track. The **INTELLIGENT SERIES** provides three). The heads are automatically positioned to the outer test Track (Track **A**) and measurements begin in the **NORMAL** mode (auto seeking to all Index to Data Tracks) and then automatically to the middle test Track (Track **B**) and then the inner test Track (Track **C**) where the measurement process is repeated and Displayed. This constitutes one pass of the Test. The Display readings are in ***microseconds***. This is continuously repeated until halted by the operator. To add flexibility, there are two additional modes that may be selected once the Test has started. These added testing modes are located in the **AUXILIARY** Row, at Keys **4, 5,** and **6**.

Key **4** is designated **INNER/OUTER**. When this function is selected, the Test will be operated alternately between the outer and inner test Track with each depression of Key **4**. Key **6** is designated **SELECT**. When this function is selected, the Test halts, and the Display blinks the current test Track value. Use the

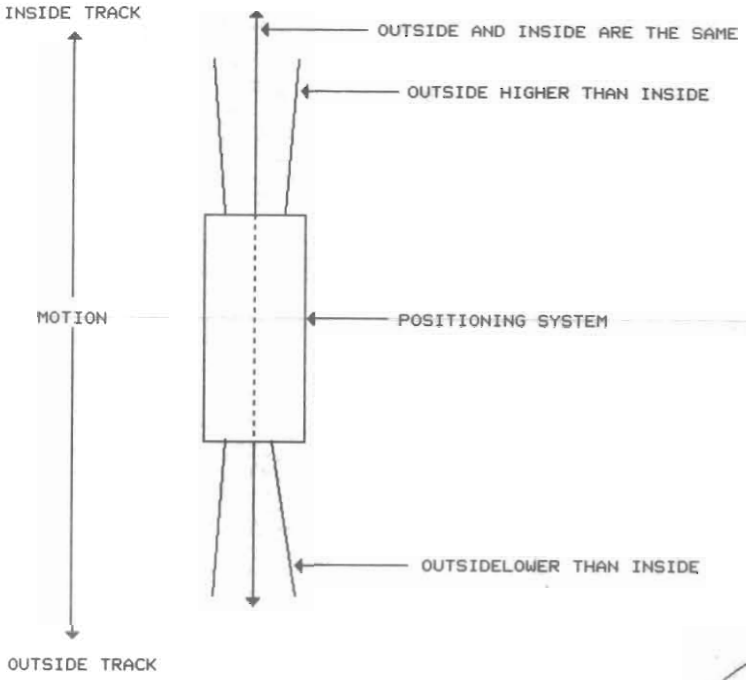
Column Keys to select the desired test Track and **ENTER**. The heads are positioned to the requested test Track and readings begin. For all of these auxiliary methods, depress any Row Key to exit the Test. The range of measurement is from ***0 - 999 microseconds*** with a resolution of ***1 uS***. This Test operates in the same manner, regardless of the **ALIGN MODE** setting.

NOTE

Some 8" double sided drives do not provide for testing of the Index associated with the top head due to an interlock circuit that prevents the Index associated with the top head from being presented to the interface. For these situations, a pair of probes is provided (Blue and Yellow), to generate this signal. The Blue (**INDEX IN**) probe is connected to a point where the Index signal associated with Head 1 is available. The Yellow (**INDEX OUT**) is connected to the Index Output on the interface of the drive. A switch is provided which is located under the Blue Analog Receiver that will invert the signal on the Yellow probe so that both Index pulses have the same true negative output. This facility is not available in dual channel analog configurations and is replaced by a pair of ***YELLOW*** probes for Head 1 analog.

POSITIONING SYSTEM LINEARITY

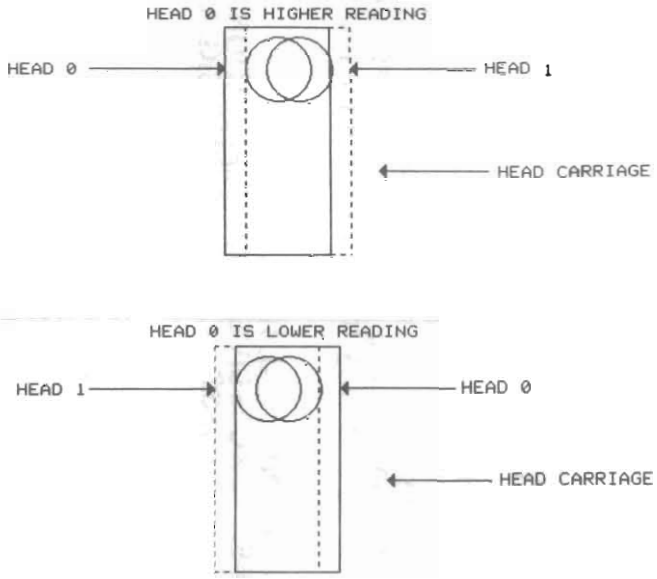
DIFFERENCE BETWEEN OUTSIDE AND INSIDE READINGS



INDEX TO DATA

Y AXIS DISPLACEMENT

DIFFERENCE BETWEEN HEAD 0 AND HEAD 1 READINGS



MEDIA LAYOUT

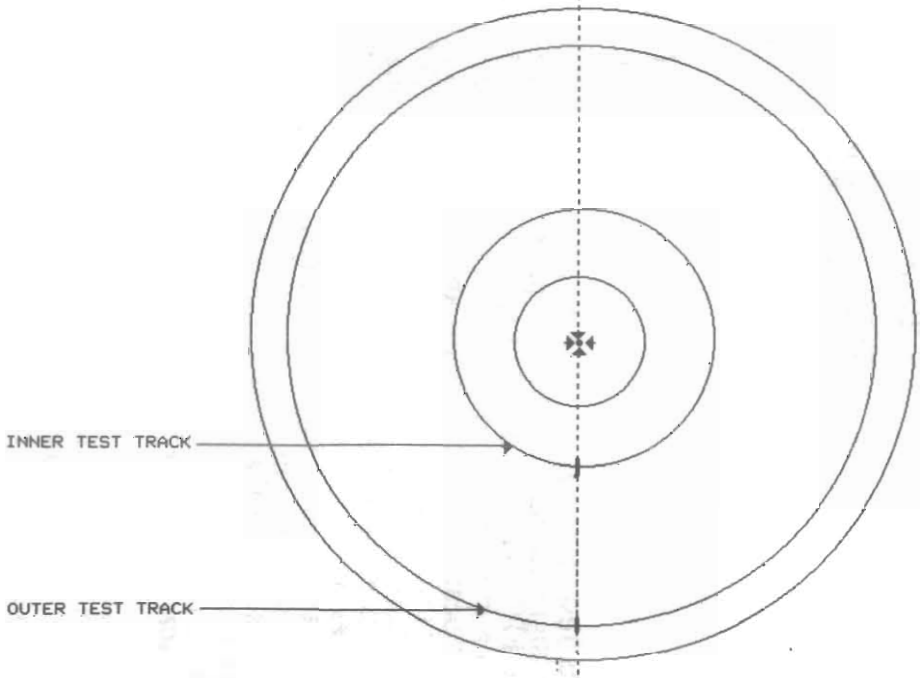


FIGURE 8

BRIAN INSTRUMENTS, INC.

INDEX TO DATA

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INDEX TO DATA (Cont'd)

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **4**. The Tester automatically begins measurements in the **NORMAL** mode. The Display is updated as each of the test Tracks is measured. The values are in ***microseconds*** and presented for each head concurrently. If adjustments are to be made, depress Column Keys **4** or **6** to use the **INNER/OUTER** or **SELECT** modes respectively. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

P I/D S: 205P 230P 250P D: 220P 245P 265P - NORMAL READINGS
F I/D S: 205P 230P 250P D: 820F 845F 865F - EXCESSIVE HEAD SEPARATION
F I/D S: 205P 530F 850F D: 220P 545F 865F - EXCESSIVE POSITIONING SKEW

I/D = INDEX TO DATA TEST
S:205P = Track A, Head 0, 205 microseconds
230P = Track B, Head 0, 230 microseconds
250P = Track C, Head 0, 250 microseconds
D:220P = Track A, Head 1, 220 microseconds
245p = Track B, Head 1, 245 microseconds
265P = Track C , Head 1, 265 microseconds

AZIMUTH
(KEY 5)

This Test measures the azimuth angle error of the read/write heads by sampling a special test Track on the alignment diskette that has prerecorded signals at precision angles for measurement and comparison (see **FIGURE 9**). The **INTELLIGENT** Series alignment diskette utilizes multiple angle signal pairs to form a group for the purpose of extending the range of measurement and noticeably improving accuracy and repeatability. The groups are repeated around the Track many times to Auto Correct the effects of Modulation/Eccentricity. Please refer to the **INTELLIGENT** Series Alignment Diskette Specifications for details about the number of burst sets and angular sense range for each style of diskette. As a result, Azimuth error is presented directly in ***tenths of minutes*** when the values are below ***10 minutes*** and in ***minutes*** when above. Resolution of the Test is ***0.1 minute***. When in the ***cateye*** Mode, the first quad bursts are sampled for 8 revolutions, averaging the samples to partially compensate for high frequency and noise variations. The Azimuth error is presented in ***burst ratio*** with a resolution of ***1%***. When the value is greater than 100%, the sense angle of the diskette has been exceeded. Refer to the particular alignment diskette manufacturer for formulas or charts to convert this burst ratio value to minutes of arc. When in the **INTELLIGENT SERIES** or ***Sony RZW406D*** Mode, the Azimuth measurement is presented in ***tenths of minutes***. When a value is ***minus***, the additional ***Decimal*** in the Display is On.

The Tester automatically positions the Heads to the test Track and measurements begin. The Display presents the Azimuth angle error and direction (negative values are counter clockwise) for each Head. The Display is updated each revolution of the diskette (**INTELLIGENT SERIES** Mode only), providing a practical means of making adjustments, if desired.

Each **TEST TABLE** is equipped with an **ALIGN MODE** Parameter and is used to preset the measurement style. When set to **00**, the Tester begins measurements in the ***cateye*** Mode. When set to **01**, the Tester begins measurements in the **INTELLIGENT SERIES** Mode. When set to **02**, the Tester begins measurements in the **Sony Model RZW406D** Mode (in this Mode, the Azimuth measurements are also presented in ***minutes***). For maximum convenience, the Tester provides separate pass/fail limits for **INTELLIGENT SERIES**, and ***cateye*** measurements. Whenever the Align Mode is changed, the appropriate pass/fail parameter and nomenclature (minutes or burst ratio) are presented by the Tester/Printer.

AZIMUTH (Cont'd)

For convenience, the Tester provides a feature that allows the Tester to measure both commercial ***cateye*** and **INTELLIGENT SERIES** alignment diskettes while the Test remains active. In this manner, convenient distribution and correlation can be determined. To accomplish this, once the Test starts, depress **CHANGE ALIGN TYPE** (Key **C**) and then insert the other type diskette. The Tester changes analog sampling Mode between **INTELLIGENT SERIES** and ***cateye*** style diskettes. For maximum convenience, the Tester provides separate pass/fail limits for **INTELLIGENT SERIES** and ***cateye*** measurements. Whenever the Align Mode is changed, the appropriate pass/fail parameter and nomenclature (uM or %) are presented by the Tester and Printer. Because there is no method to correct for **ECCENTRICITY, MODULATION** or **HUMIDITY** in ***cateye*** diskettes, the values presented are uncorrected and should be taken into consideration when correlating. Each depression of Key **C** alternates the measurement technique between these two types. Depress any Row Key to exit and print the final measurement.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **5**. The heads are automatically positioned to the test Track and measurement begin. The Azimuth angle error is presented for both heads (in ***minutes*** or ***burst ratio %***). Depressing **CHANGE ALIGN TYPE** (Key **C**) changes between **INTELLIGENT SERIES** and ***cateye*** measuring style. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit. The printer always prints the final measurement.

BRI AZIMUTH 0:-11.2'P G3 1:+33.1'F G3

CAT AZ SN044 0:-78%P G3 1:+107%F G3

SONYAZ SN019 0:-11.2'P G3 1:+33.1'F G3

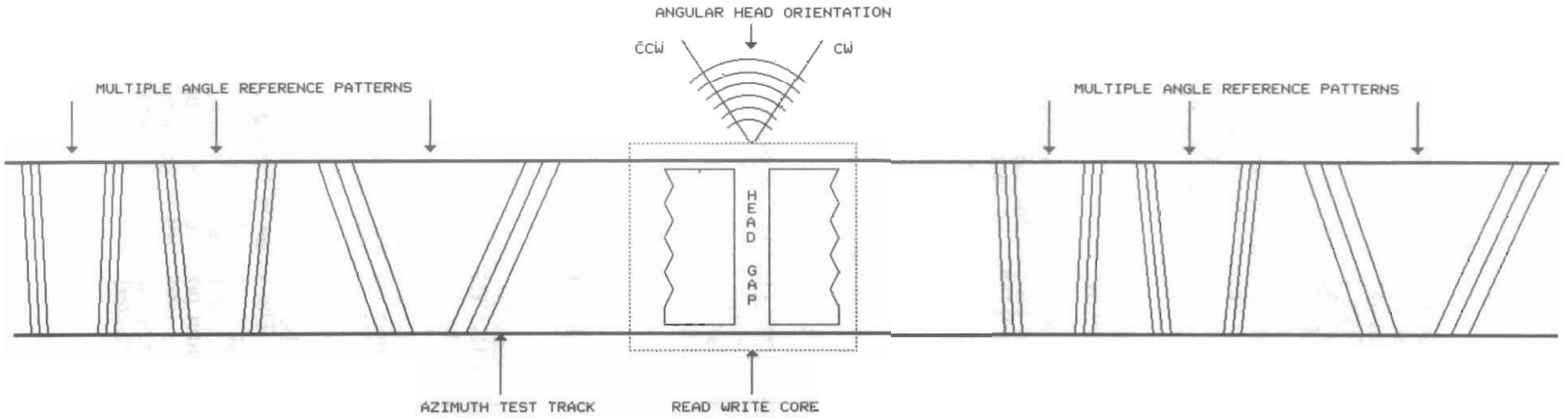
BRIAZI = AZIMUTH TEST, INTELLIGENT SERIES
0:-11.2'P =Head 0 Azimuth angle error - Pass
1:+33.1'F =Head 1 Azimuth angle error - Fail
G3 = A.G.C. level of Analog Receiver

TRACK 00 SENSOR ALIGN
(KEY 6)

This Test measures the time from the Step pulse until the Track 00 sensor changes state as the head is stepped back and forth between two adjacent tracks (see **FIGURE 6**). To accomplish this, the Red **PHASE A** probe of the **ANALOG RECEIVER** is connected to the Track 00 sensor output test point. The Tester begins the Test at Track 5 and steps ***OUT*** to Track 4 monitoring the sensor for a change in state. The drive continues to be stepped OUT until a change in state is detected. Once a state change has been detected, the Tester steps back and forth between these two Tracks, measuring the time from step OUT to the state change (**T1**) and step IN to the state change (**T2**). The Tester calculates the percentage difference of T1,T2 using the formula: T1 - T2/larger of T1,T2 X 100.

The left section of the Display presents the Track from which the state change occurs. If the left section displays **2**, the sensor is changing state between Track 2 and 1. The value in the right section is the percentage difference from the calculated center. If the sensor changes state half way between the two tracks, then T1 = T2 and the percentage difference is **0**. If the sensor is nearer the high Track, then T1 > T2 and the percentage difference is positive and vice versa. The optimum point for the sensor to change state is half way between Phase A's of the position motor. For this, it is important to know whether the position motor is of 2,3 or 4 phase configuration. If no state change is detected, the Test automatically begins again at Track 5, repeating the above process until a state change is detected.

AZIMUTH



TRACK 00 SENSOR

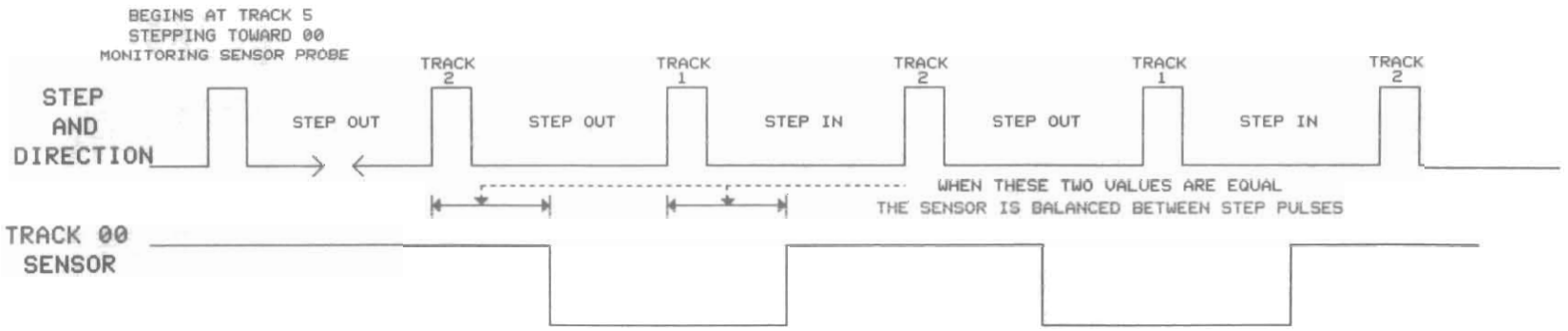


FIGURE 9

BRIAN INSTRUMENTS, INC.

AZIMUTH/TRACK 00 SENSOR

D		BRIKON/QUICKLIGN	REV : A
DATE: 1 FEBRUARY 1993			SHEET 1 OF 1

TRACK 00 SENSOR ALIGN (Cont'd)

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Make sure the **RED** probe is on the correct test point. Depress Key **6**. The positioning system is stepped to Track 5. The positioning system is then stepped OUT to Track 4 while monitoring the Red Probe which is connected to the Track 00 sensor test point on the drive. If the sensor does not change state, the heads step to Track 3 and so on, until the sensor changes state. Once this state change has been detected, the positioning system seeks between the two Tracks, measuring the time difference between Step and sensor state change. The Display shows the **"FROM"** Track in the left section, and the percentage error from center in the right section. Adjust to the desired value. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test is activated. Depress any Row Key to exit and print the final measurement.

P 00SENS +13%P FR:2P IN:4.5 OUT:4.0 mS

P 00SENS = TRACK 00 SENSOR TEST
+13%P = POSITIVE 13% FROM CENTER - PASS
FR:2P = FROM TRACK IS 02 - PASS
IN:4.5 = STEP IN TO STATE CHANGE IS 4.5 mS
OUT:4.0 = STEP OUT TO STATE CHANGE IS 4.0 mS

AUTO ALIGN
(KEY 7)

This Test provides the ability to perform the following functions, linked together, to form a comprehensive single button inspection Test.

INDEX TO DATA BURST TIMING
TRACK 00 SENSOR ALIGN
HEAD STEP SETTLE TIME
OPTALIGN/HYSTERESIS
MULTITRACK ALIGN
HEAD AMPLITUDE
WINDOW MARGIN
ECCENTRICITY
RESOLUTION
ASYMMETRY
AZIMUTH

The user has the ability to change which Tests and the number of times each Test is performed in the linked program along with the Pass/Fail limits of each Test. In this manner, a single button test can be constructed to the specific test environment desired. The **INTELLIGENT SERIES** diskette is used to measure the alignment related characteristics (**OPTALIGN, AZIMUTH, INDEX TO DATA**) of the drive, the mechanical performance measurements (**STEP SETTLE, RESOLUTION,** etc.) and bit jitter characteristics in a single pass Test without having to change diskette, which is required when using a ***cateye*** diskette. This Test is preset to perform the key measuring functions to assure accuracy and consistency with minimal test time. Refer to the **CONFIGURATION WORKSHEET AND PROGRAMMING INSTRUCTIONS** that accompany the Tester for the preset configuration.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **7**. The Tester automatically begins testing, by performing a series of analog performance and alignment Tests, followed by the bit jitter Tests (**INTELLIGENT SERIES** only). Both the Display and printer present the Test measurements along with Pass/Fail. The printer, for this Test, is automatically **ON** to record the Test information. Depress any Row Key to exit. At the conclusion of the Test, a single Summary line is printed, identifying the Pass/Fail and preset test Tracks as follows.

P R304APPPPPPPP2+00+000100400504007507 50

P	=	Passed AUTO ALIGN Test
R3	=	Drive Select Code/Port Number if MUX is active.
04	=	TEST TABLE Number
A	=	AUTO ALIGN Test (S = AUTO SYSTEM TEST)
P	=	Pass INDEX PERIOD-P.W/ECCENTRICITY
P	=	Pass OPTALIGN/HYSTERESIS
P	=	Pass INDEX TO DATA/WINDOW MARGIN
P	=	Pass AZIMUTH/ASYMMETRY
P	=	Pass RESOLUTION
P	=	Pass STEP SETTLE
P	=	Pass AMPLITUDE/TRACK 00 SENSOR
P	=	Pass MULTITRACK ALIGN
2	=	Number of Heads
+00	=	Correction Factor, Head 0 (Cateye type only)
+00	=	Correction Factor, Head 1 (Cateye type only)
010	=	ECCENTRICITY/COMPLIANCE Track
040	=	ALIGN TRACK
05	=	HYSTERESIS Offset
040	=	AZIMUTH Track
075	=	RESOLUTION Track for 1F pattern
075	=	RESOLUTION Track for 2F pattern

HEAD AMPLITUDE
(KEY 8)

This Test measures the analog read amplitude of the heads. The Display blinks a test Track value (preset to the inner Track for worse case testing). Use the Column Keys to change and **ENTER**. The heads are positioned to the test Track and a ***2F*** signal is written. The amplitude is then measured and presented in the Display. The amplitude for Head 1 is presented in the left three digits and the amplitude for Head 0 is presented in the right three digits. These measurements are in ***millivolts*** unless the value exceeds ***1 volt***, at which time the measurement is presented in ***volts***, resolved to ***10 millivolts*** using the decimal point in the Display. This process repeats until a Row Key is depressed to exit. For continuous printing, depress the **PRINT ON/OFF** Key (**AUXILIARY** Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

HEAD AMPLITUDE (Cont'd)

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Column Key **8**. The Display blinks the test Track value. Use the Column Keys to change and **ENTER**. The heads are automatically positioned to the test Track and measurements begin. The Display presents the amplitude measurements for each Head. The Display is updated each revolution of the diskette, providing a practical means of making adjustments, if desired. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

P AMP TRK079 G=3,3 0:642 PmV 1:625 PmV
P AMP TRK079 G=3,3 0:1.26 PV 1:1.17 PV
F AMP TRK079 G=3,6 0:642 PmV 1:098 FmV

P AMP	=	PASS AMPLITUDE TEST
TRK079	=	TEST TRACK
G=5,5	=	GAIN SETTING OF TEST FOR HEAD 0,1
0:642 PmV	=	MEASUREMENT FOR HEAD 0
1:625 PmV	=	MEASUREMENT FOR HEAD 1

SELF ERASE TEST
(KEY 9)

This Test is used to measure the amount of signal erasure and verify that the Erase coils of the Head are turning **OFF** when the Write signal is **OFF**. This is also very useful to determine if there is excessive residual magnetism within the Head structure due to Head contamination or poor erase efficiency. To accomplish this, the Heads are positioned to a test Track and a **2F** signal is written and measured for reference. The tester then turns the Write control Off and cycles the Heads across the test Track several times. The Heads are then repositioned to the reference test Track, remeasured and compared to the original reference measurement, presenting the difference expressed as a percent in the Display for each Head. It is normal for the readings to be 5% or less. This is due to small amounts of mispositioning and residual magnetism in the Heads. Excessive residual magnetism due to contamination typically causes the erasure value to be between 5% and 10%. Values above this typically mean that the Erase coils are active while the positioning system is in motion across the signal Track, in which case noticeable erasure of the signal Track occurs. As an added convenience, this Test operates in a ***write once/read continuously*** mode. In this manner, accumulative erasure can be measured over multiple passes of the Test. For continuous printing, depress **PRINT ON/OFF** (Key **B**) once the Test starts.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Column Key **9**. The tester automatically positions the Heads to the test Track and writes the reference signal and begins measurement. The Display presents the amount of erasure that occurred in the Display, expressed as a percent. A reading of 5% or less is normal. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement as shown below.

P ERASE G=4,4 0:-03% P 1:-04% P
F ERASE G=4,6 0:-03% P 1:-22% F

G = A.G.C. setting for Head 0,1

HEAD RESOLUTION
(KEY A)

This Test measures the relative frequency response of the head to high frequency and low frequency signals. The Display blinks the **1F** test Track. Use the Column Keys to change and **ENTER**. The Display now blinks the **2F** test Track. Use the Column Keys to change and **ENTER**. The heads are positioned to the **1F** Track and the signal is written and sampled by the Analog for each Head. The Heads are then positioned to the **2F** Track and the signal written and sampled by the Analog. There are ***32 samples*** taken around the Track for analysis. The **1F** and **2F** amplitudes are compared to each other, yielding a ratio expressed as percent, using the formula (**2F/1F X 100 = RESOLUTION IN PERCENT**). This process is repeated continuously, updating the Display each pass of the Test. In order to perform this test accurately, the **READ SIGNAL** Probes of the **ANALOG RECEIVER** must be connected to the drive prior to the differentiator circuit (preferably at the filter). Otherwise the readings are forced to 99%.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **A**. The Display blinks the **1F** test Track. Use the Column Keys to change and **ENTER**. The Display now blinks the **2F** test Track. Again, use the Column Keys to change and **ENTER**. The heads are positioned to the **1F** test Track and the signal written, measured and stored. The heads are then positioned to the **2F** test Track and the signal written, measured and stored. The Display presents the calculated value for each Head. The Display is updated each pass of the Test. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

```
P HEAD RESOL G0=4 0:+82%P G1=4 1:+79%P
F HEAD RESOL G0=4 0:+82%P G1=6 1:+27%F
```

HEAD RESOL	=HEAD RESOLUTION TEST
G0=4	=GAIN SETTING OF TESTER FOR HEAD 0
0:+82%P	=HEAD 0 RESOLUTION MEASUREMENT
G1=4	=GAIN SETTING OF TESTER FOR HEAD 1
1:+79%	=HEAD 1 RESOLUTION MEASUREMENT

HEAD STEP SETTLE
(KEY B)

This Test measures the time it takes the Heads to leave a Track, step to an adjacent Track and have the read signal amplitude settled to within 80% of full amplitude (see **FIGURE 10**). The Display blinks the test Track value. Use the Column Keys to change and **ENTER**. The heads are positioned to the test Track where a reference **2F** signal is written. The heads are then stepped **OUT** by a Track and then **IN**, taking analog samples every ***500 microseconds***. The samples are then compared to the reference, beginning with the ***last*** sample first. The **STEP SETTLE** Time is the first sample encountered that goes below the threshold setting (80%). The measurements are in ***milliseconds*** resolved to ***0.5 mS***. The measuring accuracy and repeatability are ***0.5 mS***. To enhance testing, the measurements are made when approaching the test Track from both directions. If Track 00 is selected as the test Track, the measurement is made only in the ***OUT*** direction. The reference signal is written only one time, and all subsequent measurements are based on that reference. In this manner, on line experiments may be performed while monitoring the effects.

HEAD STEP SETTLE (Cont'd)

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **B**. The Display blinks the test Track value. Use the Column Keys to change and **ENTER**. The heads are positioned to the selected test Track and the reference signal is written, sampled and stored for comparison. The Display presents the measured values for each Head and each direction with the Display being updated whenever a change in measurement occurs.

For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

P HDSTP 44 0>12.5P <13.0P 1>12.5P <13.0P
F HDSTP 44 0>12.5P <25.0F 1>12.5P <25.0F

HDSTP	=	HEAD STEP SETTLE TEST
4,4	=	GAIN SETTING OF TESTER HEAD 0,1
0>12.5P	=	HEAD 0 MEASUREMENT, HI TO LO TRACK
<13.0P	=	HEAD 0 MEASUREMENT, LO TO HI TRACK
1>12.5P	=	HEAD 1 MEASUREMENT, HI TO LO TRACK
<13.0P	=	HEAD 1 MEASUREMENT, LO TO HI TRACK

HEAD LOAD SETTLE TIME
(KEY C)

This Test is used to measure the time it takes the heads to load and the read data amplitude settled enough to achieve 80% of the reference amplitude for 8" drives. The measurements is preceded by selecting the test Track. The heads are positioned to the test Track and a reference signal is written, sampled and stored for comparison. The heads are then **UNLOADED**. At the next Index the heads are **LOADED** and amplitude samples are made every **500 microseconds** for each head. Amplitude comparisons are made, beginning with the ***last*** sample. The first sample that falls below the threshold setting is the **HEAD LOAD SETTLE** Time. The reference pattern is written only one time, and all subsequent measurements are based on that reference. The Display is updated every revolution of the diskette. The measured values are in ***milliseconds***, resolved to 0.5 mS. The accuracy and repeatability are 0.5 mS.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

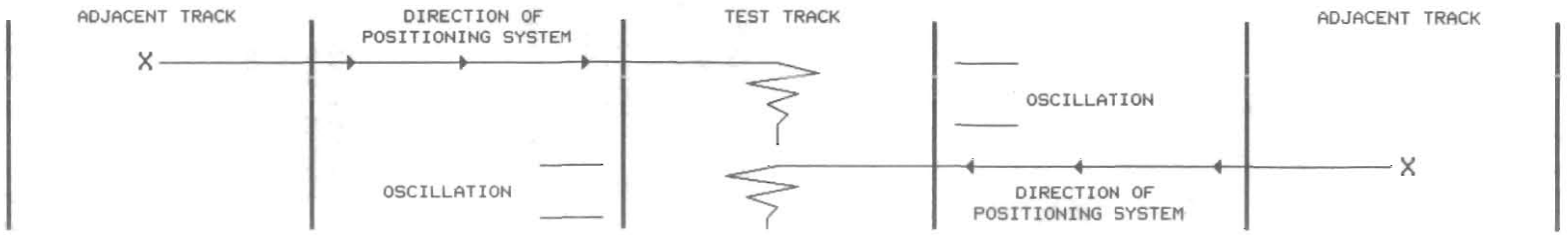
Depress Column Key **C**. The Display blinks the test Track value. Use the Column Keys to change and **ENTER**. The heads are positioned to the test Track and the reference signal is written, sampled and stored. The heads are then **UNLOADED** and **LOADED** during the measurement. The Display presents the measurements for both heads and the readings are in milliseconds. For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

P LOAD SETTLE 0:13.5P 1:16.0P
F LOAD SETTLE 0:13.5P 1:58.5F

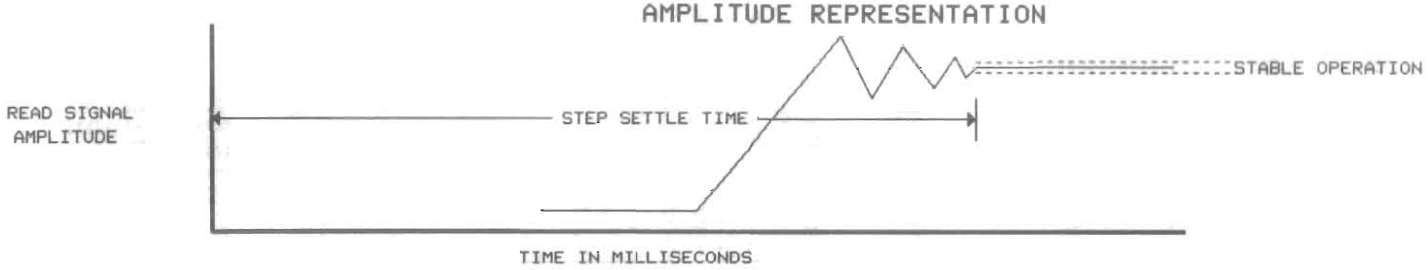
LOAD SETTLE	=	HEAD LOAD SETTLE TEST
0:13.5P	=	MEASURED VALUE FOR HEAD 0
1:16.0P	=	MEASURED VALUE FOR HEAD 1

STEP SETTLE TIME

PHYSICAL REPRESENTATION



AMPLITUDE REPRESENTATION



MOTOR START TIME

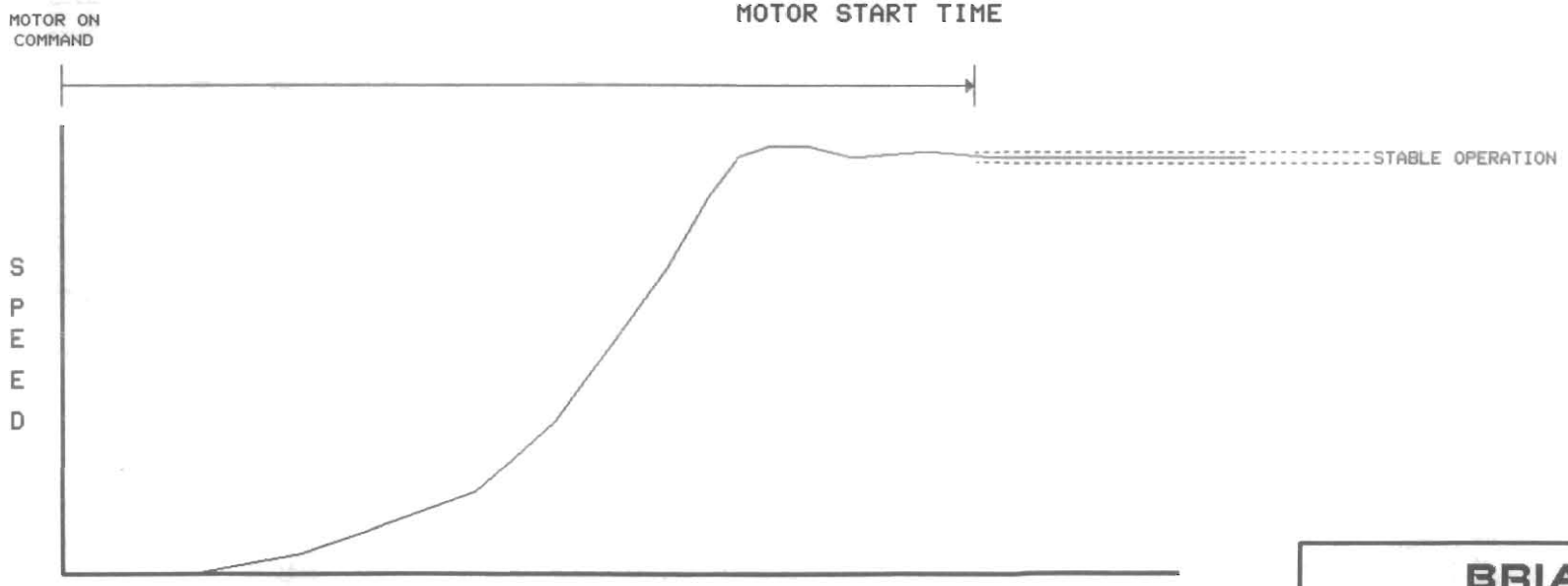


FIGURE 10
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BRIAN INSTRUMENTS, INC.			
STEP SETTLE/MOTOR START			
D		BRIKON/QUICKLIGN	REV : A
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MOTOR START TIME
(KEY D)

This Test is used to measure how many ***milliseconds*** it takes for the spindle motor to come up to full and stable rotation speed (see **FIGURE 10**) and is very useful to determine if there is any binding of the spindle system, causing the time to be high or inconsistent. The Test automatically positions the heads to the test Track, where reference signal bursts are written. The spindle motor is then turned **OFF**, with a 6 second Motor Off delay. The Motor is then turned **ON** and sampling begins where the measured duration of each burst is compared to the reference. The measurement includes any over/under shoot of the spindle system. The Display presents the measured value in the right section. The value is in ***milliseconds***, resolved to ***1 mS***. The accuracy and repeatability is ***+/- 4 mS***. The measuring range is 999.9 ms. The reference signal is written only one time, and all subsequent measurements are based on that reference.

PROCEDURE
Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Column Key **D**. The Test automatically positions the heads to the test Track and writes the reference signals. The Display presents the measured value in the right section. The Test repeats continuously, updating the Display after each measurement (about 6 seconds). For continuous printing, depress the **PRINT ON/OFF** Key (Auxiliary Row, Key **B**) once the Test starts. Depress any Row Key to exit and print the final measurement.

P MOTOR START 307 P mS
F MOTOR START 865 F mS

MULTITRACK ALIGN TEST
(KEY E)

The Multitrack version of **INTELLIGENT SERIES** Alignment Diskettes are designed to expand the measurement capabilities of the Tester/Diskette combination by providing multiple alignment test Tracks for measurement and subsequent analysis. This is a very useful facility for characterizing the positioning system profile for runout and linearity. The diskette has alignment information at up to **11** locations and is used in conjunction with the **MULTITRACK ALIGN** Test in the **ALIGN** Row at Key **E** of the Tester. For added performance, the Test may be perform with the positioning system approaching the track from either or both directions. The **MULTITRACK ALIGN** function performs the following measurements:

1. Automatically measure each alignment Track for Head 0, Printing each measurement. Measure Head 1 at the center location, Printing the measurement and the calculated ***Head Separation***. The Display presents the measured values while this portion of the Test is in progress. All measurements are in ***micrometers***. Positive values are toward the Spindle and negative values are toward Track 00.

2. Print the calculated ***Maximum Deviation*** from all Head 0 measured values in ***micrometers***.

3. Print the calculated ***Runout***, using the deviation between outside and inside measurements for Head 0. The value is in ***micrometers*** and includes direction.

4. Perform dynamic alignment on the Track/Head/Direction combination that is closest to the total average error measurements. The final value in the Display is the error between the actual measurement and the computed average. Adjusting the alignment until the value is **0** centers the alignment over the composite of all measured values.

The Diskette/Tester combination provides Auto Correction for Eccentricity/Modulation. This occurs concurrently while measuring each alignment Track. Correction for Humidity is performed via the **ENTER HUMIDITY** function on the Tester Front Panel. As with all **INTELLIGENT SERIES** Diskettes, metering of **75** Alignments is built in to maintain consistent measuring accuracy throughout the usable life of the diskette. This avoids measurement errors due to external characteristics such as residual magnetism and noise accumulations. When the Diskette meter reaches **0**, the Test aborts and notifies the operator through the Display and Printer outputs that no alignments are available on the diskette and a replacement diskette is required. For greatest convenience in multiple discipline environments, the Test may be performed in 3 modes; **IN DIRECTION ONLY, OUT DIRECTION ONLY,** or **BOTH DIRECTIONS** (to include Hysteresis) and is selectable via **RAM**.

MULTITRACK ALIGN TEST (Cont'd)

DISKETTE SELECTION

These diskettes are distinguishable from the single Track versions by both the labeled information and the halved Colored Dot. See below for detailed information.

MODEL	TYPE	TPI	RPM	MEDIA	COLOR	TERM	ALIGN TRACKS
00	5 1/4	96	720	2HD	PINK	2XSDS/1.2MEG	6,12,20,26,32,40,48,54,60,66,72,76
01	5 1/4	48	300	2DD	BLUE	XT/360K	5,12,16,21,26,30,37
02	5 1/4	96	300	2DD	RED	XT/720K	6,12,20,26,32,40,48,54,60,66,72,76
03	5 1/4	96	360	2HD	BLACK	AT/1.2MEG	6,12,20,26,32,40,48,54,60,66,72,76
04	3 1/2	135	300	2DD	RED	XT/720K	5,12,19,26,33,40,47,54,61,68,77
05	3 1/2	135	300	2HD	BLACK	PS2/1.4MEG	5,12,19,26,33,40,47,54,61,68,77
07	3 1/2	135	300	2ED	BROWN	4MEG/2.88	5,12,19,26,33,40,47,54,61,68,77
10	5 1/4	48	600	2DD	GREEN	2XSDS/360K	5,12,16,21,26,30,37
11	5 1/4	96	600	2DD	ORANGE	2XSDS/720K	6,12,20,26,32,40,48,54,60,66,72,76
13	5 1/4	96	600	2HD	GOLD	1.7XSDS/1.2MEG	6,12,20,26,32,40,48,54,60,66,72,76
14	3 1/2	135	600	2DD	ORANGE	2XSDS/720K	5,12,19,26,33,40,47,54,61,68,77
16	3 1/2	135	600	2HD	GREEN	2XSDS/1.4MEG	5,12,19,26,33,40,47,54,61,68,77
17	3 1/2	135	360	2HD	BLUE	AT/1.2MEG	5,12,19,26,33,40,47,54,61,68,77

PROCEDURE

Align Row Indicator - BLINKING
Display Reading - CURRENT TRACK

Depress Key **E**. The Test automatically begins by performing a Seek to Track 00, verifying that the diskette type is correct and the ***Number of Aligns*** is greater than **0**. Beginning at the center Track, both Heads are measured from each direction (depends on mode). Then, starting from the outer test Track, each alignment Track is measured from both directions (depends on mode) until the inner test Track is reached. The Track offset is two tracks so that all test Tracks are measured under the same positioning system conditions. The Display and Printer outputs the measured alignment information for each Track. All of these values are in ***micrometers***. Next, the ***Head Separation*** value is Printed. When this value is positive, Head 1 is positive compared to Head 0 and vice versa. This value is in ***micrometers***. The Printer then outputs the calculated ***Maximum Deviation***. This value is in ***micrometers***. The Printer then outputs the calculated ***Runout***. This value is in ***micrometers***. Positive values mean the Runout is positive (or long) and vice versa.

The Tester places the positioning system at the Track/Head/Direction combination that is closest to the calculated average error measurements. The value in the Display is the error direction and distance (in ***micrometers***) from this balance point. Positive values are toward the Spindle and negative values are toward Track 00. For optimal alignment, adjust the drive until the value is **0**. For maximum convenience, depressing Key **E** when the AVERAGE value is in the Display causes the Test to restart (# ALIGNS does not decrement). This feature is used to make sure all Tracks Pass after the adjustment is made. Depress any Row Key to exit and Print the final adjustment as follows.

MULTITRACK ALIGN: uM

	HD0:IN	HD0:OUT	HD1:IN	HD1:OUT
P TRK 040	+06 P	+04 P	+04 P	+02 P
P TRK 005	+02 P	+00 P	____ P	____ P
P TRK 012	+04 P	+02 P	____ P	____ P
P TRK 019	+04 P	+02 P	____ P	____ P
P TRK 026	+05 P	+02 P	____ P	____ P
P TRK 033	+05 P	+02 P	____ P	____ P
P TRK 047	+07 P	+02 P	____ P	____ P
P TRK 054	+08 P	+02 P	____ P	____ P
P TRK 061	+09 P	+02 P	____ P	____ P
P TRK 068	+09 P	+02 P	____ P	____ P
P TRK 077	+10 P	+08 P	____ P	____ P

SEPARATION: -02 uM
MAXDEV: 08 uM
RUNOUT: +08 uM
P AVTRK 040,0: < +06 uM

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INSTRUMENTS

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