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REDESIGN OF BENDIX VARIABLES DATA SYSTEM

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Several considerations, when assimilated into an overall review, prompted the decision to redesign the Bendix Variables Data System. Briefly, these are:

1. Recent surveys indicate a data growth rate by FY1982 of approximately ten (10) times current annual volume.
2. Requirements to edit, store, retrieve, and analyze data in exponential notation format.
3. Requirements to edit, store, retrieve, and analyze digitized waveform data.
4. Need to develop real-time maintenance capabilities for the system's control files.
5. Improvement of on-line data retrieval and analysis capability for Bendix and Design Agency users.
6. The off-line (batch) portion of the redesigned system must be capable of (1) selective and concurrent file updates, and (2) self-generation and scheduling of the tasks to be executed.

A two-phased implementation schedule is planned. On-line maintenance of the system's control files is scheduled for June, 1978, and the balance in January, 1979.

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REDESIGN OF BENDIX VARIABLES DATA SYSTEM

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Although the abstract, as published, was a synopsis for our overall redesign effort, this paper will focus on only those aspects relating to our planned support for digitized waveform data.

The reader should be familiar with the contents of the paper "A Proposed Format For the Recording and Transmission of Digital Transient Signals in GEISHA" by D. A. Young and J. R. Yoder, SLA; as this paper will frequently reference formats and other considerations contained therein.

Our current planning for digital signal processing is based on the premise that the above proposed formats will become a part of the GEISHA language.

Product Testers

Due to the volume of data generated, we recommend that testers, generating digitized waveforms for inclusion in our data system, be hard-wired into the Mezzanine Data Acquisition System. This DAS requires tester output to be in card GEISHA format. In the

case of multiplexed waveforms (i.e., a "D" record contains more than one waveform), the tester output must be card GEISHA format. This restriction is necessary when considering the extraordinary length of the output record if recorded in any other format.

Data Editing

During the edit phase, multiplexed waveforms will be decommutated and passed to the file maintenance program as single waveforms.

To facilitate editing, a new data type, "W", will be utilized to denote that a non-standard ID contains waveform data.

EXHIBIT A

MASTER FILE RECORD DESCRIPTION

VARIABLES DATA RECORD

01	VADA-RCD.	
02	SEQ-ALL.	
03	SEQ-FA.	
04	PN	PICTURE X(8).
04	MFG-CD	PICTURE X(4).
04	TST-CD	PICTURE X(2).
04	SRC-CD	PICTURE X.
04	LOT-NO.	
05	LOT-N	PICTURE X(4).
05	LOT-SFX	PICTURE X.
04	SER-N	PICTURE X(8).
03	TST-TM.	
04	TST-DT	PICTURE X(6).
04	TM-O-DAY	PICTURE X(4).
03	RCD-TY	PICTURE X.
03	FILLER	PICTURE X(6).
02	OTHR-HDR-FLDS.	
03	TSTR-N.	
04	TSTR	PICTURE X(8).
04	TSTR-SN	PICTURE X(6).
04	TSTR-TY	PICTURE X(6).
03	DT-CD	PICTURE X(6).
03	XMITN-CNTL	PICTURE X.
03	BXPN-SFX	PICTURE XXX.
03	SPN-SFX	PICTURE XX.
03	PRD-SPEC.	
04	PS-PFX	PICTURE XXX.
04	PS-SFX	PICTURE XXX.
03	NOMNCL	PICTURE X(11).
02	ATT-NO	PICTURE 9(4).
02	ATT-SW	PICTURE X.
02	CRE-DT	PICTURE S9(5) COMPUTATIONAL-3.
02	XMITN-IND	PICTURE X.
02	XMITN-DT	PICTURE S9(5) COMPUTATIONAL-3.
02	REV-DT	PICTURE S9(5) COMPUTATIONAL-3.
02	N-FAIL	PICTURE S9(3) COMPUTATIONAL-3.
02	TST-CNT	PICTURE S9(3) COMPUTATIONAL-3.
02	TST-INFO	OCCURS 500 TIMES DEPENDING ON TST-CNT.
03	TST-DATA.	
04	TST-N	PICTURE X(6).
04	TST-TYPE	PICTURE X.
04	TST-RDNG	PICTURE X(8).
04	DISP-CD	PICTURE X.
04	XMITN-SW	PICTURE X.

EXHIBIT B

MASTER FILE RECORD DESCRIPTION

WAVEFORM DATA RECORD

01	WVFRM-RCD.	
02	SEQ-ALL.	
03	SEQ-FA.	
04	PN	PICTURE X(8).
04	MFG-CD	PICTURE X(4).
04	TST-CD	PICTURE X(2).
04	SRC-CD	PICTURE X.
04	LOT-NO.	
05	LOT-N	PICTURE X(4).
05	LOT-SFX	PICTURE X.
04	SER-N	PICTURE X(8).
03	TST-TM.	
04	TST-DT	PICTURE X(6).
04	TM-O-DAY	PICTURE X(4).
03	RCD-TY	PICTURE X.
02	OTHR-HDR-FLDS.	
03	TSTR-N.	
04	TSTR	PICTURE X(8).
04	TSTR-SN	PICTURE X(6).
04	TSTR-TY	PICTURE X(6).
03	DT-CD	PICTURE X(6).
03	XMITN-CNTL	PICTURE X.
03	BXPN-SFX	PICTURE XXX.
03	SPN-SFX	PICTURE XX.
03	PRD-SPEC.	
04	PS-PFX	PICTURE XXX.
04	PS-SFX	PICTURE XXX.
03	NOMCL	PICTURE X(11).
02	ATT-NO	PICTURE 9(4).
02	ATT-SW	PICTURE X.
02	CRE-DT	PICTURE S9(5) COMPUTATIONAL-3.
02	XMITN-IND	PICTURE X.
02	XMITN-DT	PICTURE S9(5) COMPUTATIONAL-3.
02	REV-DT	PICTURE S9(5) COMPUTATIONAL-3.
02	N-FILLER	PICTURE XX.
02	W-CNT	PICTURE S9(5) COMPUTATIONAL-3.
02	WVFRM-INFO	OCCURS 2250 TIMES DEPENDING ON W-CNT.
03	WVFRM-DATA.	
04	ELEMNT-TYPE	PICTURE X.
04	ELEMNT-DATA	PICTURE X(3).

Data Storage

As indicated in the referenced paper by D. A. Young and J. R. Yoder, SLA, a "D" record may contain data elements other than amplitude samples. In order to store these data in context with the amplitude samples, we will employ the following code schema:

<u>Data Element</u>	<u>Standard-ID</u>	<u>Element-ID</u>
Starting or Fiducial Time	TF	1
Sampling Interval	DT	2
Scaling Multiplier	AM	3
Amplitude Sample	NONE	4
Element Continuation	Not Applicable	0

This schema allows maximum utilization of the "OCCURS" areas in the Waveform Data Record (Exhibit B). Amplitude samples will be stored in packed decimal format while all other data elements, and all element identifiers will be stored in display format.

Examples:

Scaling Multiplier "AMb6.235807" would occupy three (3) occurs areas as follows:

[3][6][.][2] [0][3][5][8] [0][0][7][]

Amplitude Sample "00010" would occupy only one (1) occurs area as follows:

[4][+0][00][10]

Starting or Fiducial Time, Sampling Interval, and Scaling Multiplier entries may be expressed in exponential notation format which will require four (4) occurs areas to record. Amplitude samples will always be expressed in five (5) integers and will require only one (1) occurs area to record.

The test equipment designer should use the following formula to calculate the number of occurs areas required to record his waveform:

$$\begin{aligned} & \text{(Number of occurrences of Starting or Fiducial Time output x 4)} \\ & + \text{(Number of occurrences of Sampling Interval outputs x 4)} \\ & + \text{(Number of occurrences of Scaling Multiplier outputs x 4)} \\ & = \text{(Maximum "occurs areas" required to store the waveform)} \end{aligned}$$

Maximum number of "occurs" should not exceed 2,250.

It should be noted that the waveform elements are stored in exactly the same sequence as they appeared in the "D" record; or as decommutated, in the case of multiplexed waveforms.

Retrieval and Analysis

No definition exists as yet in this area.

Data Transmission to Design Agencies

Data will be extracted from our files and recoded in the "D" record format for transmission. We anticipate the need for further

negotiations in this area especially concerning automated correction capabilities.

Summary

As stated previously, our planning is based primarily upon the contents of the paper "A Proposed Format For the Recording and Transmission of Digital Transient Signals in GEISHA" by D. A. Young and J. R. Yoder, SLA.

If the contents of that paper change drastically, or if the Design Agency cannot support implementation on a timely basis, then our support efforts will be seriously impaired.

Mr. Morris is a Systems Analyst, Staff at Bendix Kansas City. He is currently the project leader for the Redesign of the Bendix Variables Data System; and in-house consultant for Structured Programming Techniques. Past assignments include the original Bendix Variables Data System, Tool Cost Monitor Systems, and Specification Exception Release (SXR) Reporting System. Mr. Morris, a 1955 graduate of Southeast Missouri State University with a B.S. in Accounting, has been associated with Bendix Kansas City since 1957.