Application Note

The Use of a Computer to Process 3550 Disk Data

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Introduction

This application note shows how to store data on the built-in 3550 disk drive, and how to use the stored data in commercially available IBM-PC application software such as spreadsheets or word-processors.

3550 File Formats

The 3550 is capable of storing data on its built-in floppy disk drive in various formats. The formats can be divided into two main groups. One type of format is used to store data for later recall into the analyzer. Another type is used to transfer data from the analyzer to an IBM compatible PC, using the floppy disk as the medium. This latter format is covered by this application note and can be subdivided into two groups: **numerical** data and **graphical** data.

Numerical Data Formats

The numerical data format is either a single value (the cursor value or a special calculated value, or a multiple value (spectrum, slice, function, etc.)

The following example shows you how to store a spectrum on disk and how to use it in conjunction with a spreadsheet.

Preparation:
For the spreadsheet program we need not only the cursor values but also the cursor positions. The settings of the analyzer therefore have to be modified a little compared to the default settings, see Fig. 1.

Select System Setups (page 8), [Miscellaneous]. Go to the bottom line, and correct as follows:

```
MISCELLANEOUS                                  Blank Defaults: NO

Digital I/O:          <Output> Key Destination: IEEE-488

IEEE-488 Bus:         Device Address:                          26
                      Output Terminating Sequence:   TERMINATOR & EOI
                      Interface Terminator:                    LF
                      Buffer for Manual Output and Plot:       ON
                      Show Interface Message Mnemonic:      0.000s

RS-232-C Interface:   Word Length: 8 BITS   Parity:     NONE
                      Stop Bits:   1        Baud Rate: 19200
                      Handshake:   XON/XOFF

Clock:                DAY-MONTH-YEAR        14-JAN-1994  15:06:54

Keyboard or RCU:      EXTERNAL KEYBOARD

Superimposed Format:  OFF




Setup Verification:   ON
<Store>, <Output>:    CURSOR VALUES: CURSOR POSITION INCLUDED: YES
```

Fig. 1 For spreadsheets the cursor position is important

⟨Store⟩, ⟨Output⟩: Cursor values: Cursor position included: [**YES**]

Then:

1. Make the measurement. Refer to the instruction manual for further information
2. Select the appropriate function on the display
3. Insert a formatted disk into the disk drive
4. Press the ⟨**Disk File Store**⟩ key and select [`Cursor Values`] as Data Type
5. Move the cursor to the next field to the right in the command line (Data Type Parameter 1) and select [`All Main`], to store the whole frequency range
6. Move the cursor to the next field to the right in the command line (Data Type Parameter 2) and select [`Print Format`]
7. Move the cursor to the last (right-hand) field of the command line (Store File Name) and key in the file name you want to use
8. Press ⟨**Command/Execute**⟩ to store the data on the disk

The disk can now be inserted into a PC. An example of a frequency response function (magnitude) is shown in Fig. 2 (only a few of the 800 data points are shown).

The syntax is described in the 3550 Instruction Manual Vol.4 IEEE/IEC Interface (page 8-2), but the parts relevant for this figure are mentioned here:

1. Line 3 is number of averages
2. Lines 7 to 10 are the time (year, month and day, hours, minutes and seconds)
3. Lines 17 and 18 are the number of elements and the number of values per element
4. Lines 19 to 819 contain the cursor position, a "V", indicating that the data is valid, followed by the cursor value

The data can be read directly into a word-processor, or (more interestingly) into a spreadsheet where further calculations can be performed.

The numerical data are stored with one digit after the decimal point. If

```
00001,
37632,
00005,                Number of averages: 5
00000,
01476,                BST4, read manual 4, page 8-8
25600,                Frequency span: 25.6 kHz
01993,                Year: 1993
00204,                Month: 02, Date: 04
01145,                Time of measurement: 11.45
00022,                + seconds: 22
00000,
00000,
00000,
01024,
00000,
00000,
00801,                No. of lines: 801 (800 FFT lines)
00001,                No. of values in each line: 1
0,"V",-031.8,         Frequency [Hz], "Valid", Cursor value [dB]
32,"V",-026.5,
64,"V",-026.0,
...
25.6E03,"V",-023.6,
→
```

Fig.2 Cursor values

more digits are required, use ⟨**System Setup**⟩, [Cursor Setup Extension] and set Cursor Reading Resolution to [increased].

If you have made a measurement using the multibuffer, you just specify [Measured Map] instead of [All Main] (in paragraph 5) when you press ⟨**Disk File Store**⟩. Two new numbers appear at the end of the command line. By adjusting these two numbers it is possible to store only the interesting part of the graph. The output file is displayed as shown in Fig. 3.

An example of a chart based on the frequency response function's magnitude is shown in Fig. 4. The chart was created using Microsoft®, Excel 4.0 (PC version), but the method applies to almost all other spreadsheets.

The data is imported into Excel in the following way:

1. Insert the disk which contains the 3550 data file in the PC disk drive
2. Run Windows®. Select [Control Panel] [International] and verify that List Separator is set to "," (comma) and Number Format, 1000 Separator is set to "," (comma) and Decimal Separator is set to "." (point)
3. Run Excel. Select [File] and then [Open]
4. Click on Drivers in the Open menu and select the relevant disk drive [a:]
5. Click on Text and check that the Column Separator is set to [comma]
6. Click on List Files of Type and change to [All Files *.*]. You can now select the file you want to import into your spreadsheet (typically "File001.cvp")
7. Excel will prompt you with a warning that your file is Read-Only, which is accepted by pressing [OK]

You will see the measured data on the screen. Refer to your Excel manual about setting up the display and making operations on the measured data.

A part of the measured frequency range can be stored by selecting [Main Section] instead of [All Main] in paragraph 5. Specify the first and last element number you want to store.

The Cursor Value data format contains no information about items such as dB reference, function type, input source, etc.

To store information about analyzer settings, you have two options: either [Dump Alpha], where you can store the alpha-numerical screen information, or [Text Page], where you can insert selected fields from the screen in a text page, and then store the text page.

To store the alpha-numerical screen information on disk:

```
65526,
54016,
00000,
00000,
09600,
20970,
01994,
00114,
01301,
00050,
00000,
00000,
00000,
01024,
00000,
00000,
00801,
00001,
 0, 0,"V",-099.3,
 0, 32,"V",-100.9,
 0, 64,"V",-110.0,
...
 0, 25.504E03,"V",-072.8,
 0, 25.536E03,"V",-069.3,
 0, 25.568E03,"V",-067.4,
 0, 25.6E03,"V",-066.5,
65526,
54016,
00000,
00000,
09600,
20970,
01994,
00114,
01301,
00053,
00000,
00000,
00000,
01024,
00000,
00000,
00801,
00001,
 1, 0,"V",-097.9,
 1, 32,"V",-099.8,
 1, 64,"V",-109.5,
...
```

Fig.3 Multibuffer cursor values. Note that the first number in the data line indicates the spectrum number

1. Ensure that the screen contains the information you want to store
2. Press ⟨**Disk File Store**⟩ and select [Dump Alpha]
3. Key in the file name you want to use and press ⟨**Command/Execute**⟩
4. A typical result of this operation is shown in Fig. 5.

Working with special mnemonics corresponding to the IEEE-Edit commands:

If you want to store specific fields from the analyzer screen, copy the selected field into the text page and then store the text page on disk. Proceed as follows:

1. Move the field selector to the field you want to store

2. Press ⟨**Command/Execute**⟩
3. Select [Copy Text], move the cursor right and select [Field Name And Content To Text Page] for the Copy_Text_To field
4. Select the position, line (x,y) on the text page, to which the field name and contents should be copied
5. Press ⟨**Command/Execute**⟩ to perform the copy operation. If you want to check the result, Press ⟨**System Setups**⟩ and Select [Text Page]
6. Go to step 1 again to store more fields in the Text Page, and remember to increment the Text Page pointer "Y" one step for each operation to avoid overwriting the previous text
7. Press ⟨**System Setups**⟩ and select [Text Page]
8. Press ⟨**Disk File Store**⟩ and select [Dump Alpha]
9. Key in the file name you want to use and press ⟨**Command/Execute**⟩

Fig. 6 shows the result of storing the following: frequency resolution, frequency range, dB reference and function type.

The mnemonics correspond to the IEEE-Edit commands described in the 3550 Instruction Manual Vol. 4, IEEE/IEC Interface, Chapter 6.

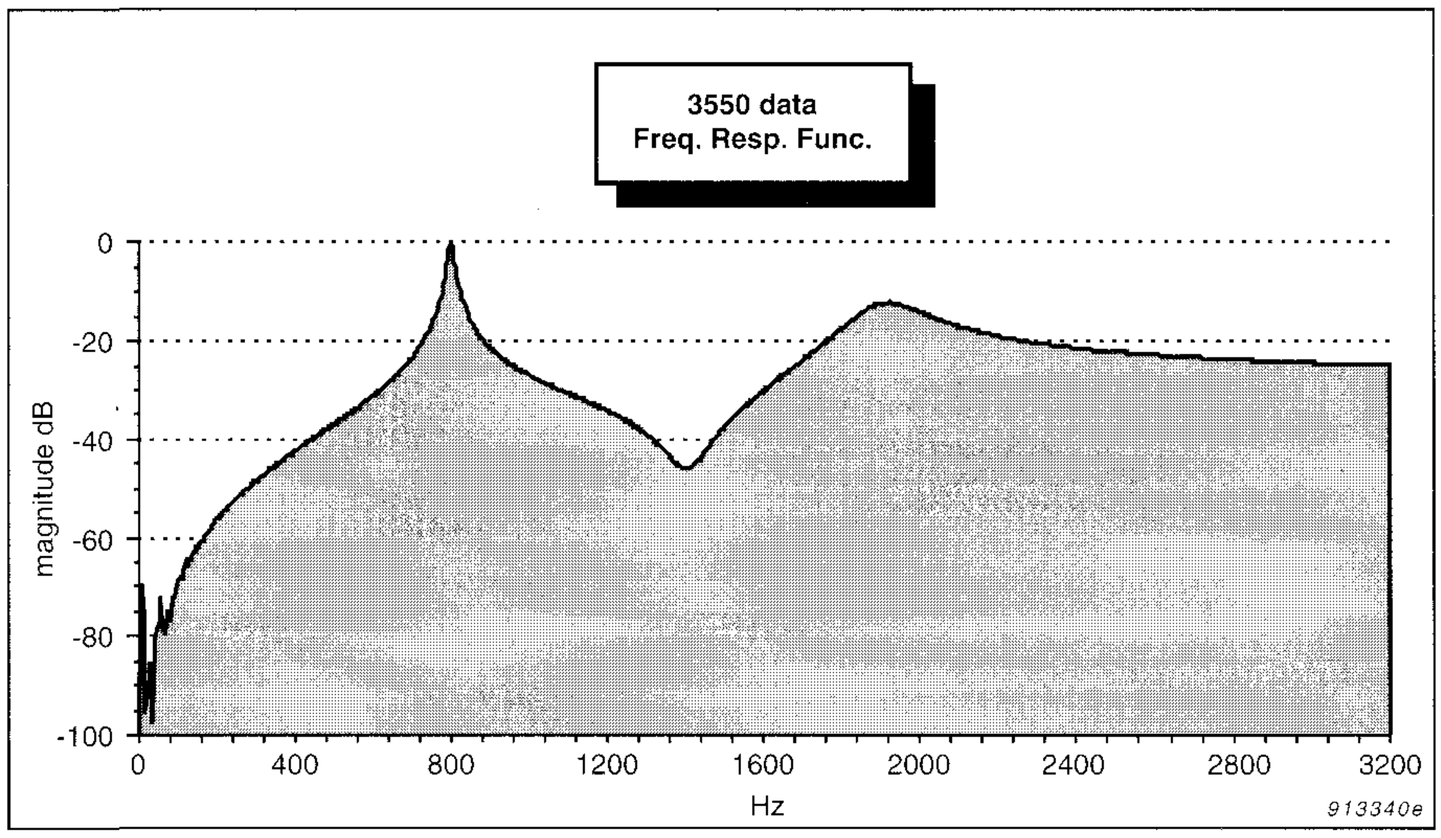

Fig.4 Chart based on spreadsheet

```
Wn FREQ RESP H1 MAG MEAS:W* Main Y: -24.8dB
Y: 0.0dB 80dB [ ] X: 3.2kHz
X: 0Hz + 3.2kHz LIN
#A: 5 [ ]


0 0.5k 1.0k 1.5k 2.0k 2.5k 3.0k
Setup W
Measurement: DUAL-CH. SPECTRUM AVERAGING 800 lines
Trigger: FREE RUN

Averaging: EXP 5 Overlap: MAX

FREQ. SPAN: 3.2kHz df: 4Hz T: 250ms dt: 122us

Weighting: HANNING
ch.A: 6V DIRECT /-0.7Hz -\ON 1.00C/Pa
ch.B: 800mV DIRECT /-0.7Hz -\ON 1V/V
Generator: RANDOM 0.0dB re 1.40V WHITE CF: 3.5 DC: 0.000V
CONTINUOUS
--store DUMP ALPHA OTHER in: DUMP_A: In progress-- 18
```

Fig.5 Dump Alpha

Graphical Data Format

The 3550 supports two different formats for storing graphical data on disk — Dump Plot and Pen Plot.

Dump Plot

The Dump Plot command stores the current screen on disk as a binary print file. There are two types of dump plot, one is for storing the screen in a TIFF format for later import into PC-application programs (e.g. WordPerfect®, Microsoft Word®), the other is for storing printer jobs.

Proceed as follows to store the current screen in a TIFF format that can be used in a PC-application program (e.g. WordPerfect®, MS Word®):

1. Press ⟨**System Setups**⟩ and select [Hard Copy Setup], [Page 1]
2. Select [Graphics Printer] as Hard Copy Device
3. Select [TIFF] as Hard Copy Device Type
4. Select the appropriate format ([Bilevel], [Halftoned Bi-level] or [Grayscale]). For most text editor programs such as WordPerfect®, [Bi-level] should be preferred. [Bi-level] gives the smallest file size, and [Halftoned Bi-level] gives the best image quality. For some DTP systems [Grayscale] gives the best result
5. Make sure the screen is the one you want
6. Press ⟨**Disk File Store**⟩ and select [Dump Plot]
7. Key in the file name and press ⟨**Command/Execute**⟩

```
ED CURS, +4
ED CURS, +3, 2E +03
ED YDRE, +20.0E -06
ED DFUN +11
```

Fig.6 Text page containing information about specific fields

The TIFF format is supported by most programs that can read graphical information (e.g. WordPerfect® 5.1, MS Word® 6.0 (input as "Picture" file), PageMaker®). However, you should be aware that the graphical resolution of the file data is the same as the screen resolution (290 by 512 dots), so re-sizing the picture in the application program may give undesirable results. Fig. 7 shows the result of a typical TIFF, Bi-level file.

To store the current screen in a **printer format**:

1. Press ⟨**System Setups**⟩ and select [Hard Copy Setup], [Page 1]
2. Select [Graphics Printer] as Hard Copy Device

3. Select Hard Copy Device Type as appropriate ([Brüel & Kjær 2313], [HP] or [IBM])
4. Make sure the screen is the one you want
5. Press ⟨**Disk File Store**⟩ and select [Dump Plot]
6. Key in the file name and press ⟨**Command/Execute**⟩

To print the file from a computer:

1. Insert the data disk in the PC disk drive
2. Type the following command at the DOS prompt:

```
COPY A: ⟨file⟩ ⟨port⟩/B
```

where ⟨file⟩ is the name of the file you want to print and ⟨port⟩ is the printer port (for example LPT1:).

Pen Plot Format

The Pen Plot command stores the current screen on disk as an HPGL plotter file (ASCII commands), with a layout that depends on the settings in the Hard Copy Set-up Pages 1 and 2. The Pen Plot can be plotted, or imported, into PC-application programs. Although the Dump Plot and the Pen Plot seem very similar, there is a significant difference: the Pen Plot file (a vector format) is a series of commands that tells the plotter how to move the pen, so the resolution is not limited to the resolution of the screen as in Dump Plot (raster format), but only to the resolution of the plotter.

Storing a Pen Plot to disk:

1. Press ⟨**System Setups**⟩ and select [Hard Copy Setup], [Page 1]
2. Select [Plotter] as Hard Copy Device
3. Make sure that the screen is the one you want. Note that the field selector should not be positioned in the Cursor field, because your plot will then consist of the cursor value only.
4. Press ⟨**Disk File Store**⟩ and select [Pen Plot]
5. Key in the file name and press ⟨**Command/Execute**⟩

If you want to make a plot, you can use a laser printer with HPGL emulation and use it exactly as if it was a plotter. All HPGL plotters accept this file format.

The Pen Plot commands can also be read by many PC programs, and so can be integrated into reports.

Running WordPerfect® 5.1 the HPGL plotter file can be imported directly using "Graphics", "Figure". If you run Microsoft® Word 6.0, it is a little more complicated. Microsoft® Word only uses a limited set of HPGL commands. Before you include it as a Picture file, you must replace ";LB" with ";SR0,4;LB" ("0" is a zero). Earlier versions of MS Word do not accept the HPGL file directly either, and the corrections to be made are more complicated. By using Dump Plot TIFF, the files are accepted, but with the drawback that the resolution is no better than the resolution on the screen.

One very interesting option of the HPGL file format is the option to edit the file, and hence change the plot result. An easy way to do this is to use a CAD program or a vector based drawing or illustration program such as CorelDraw®.

Fig. 8 shows a print-out of a Pen Plot file imported into CorelDraw®, modified, and then printed on a laser printer.

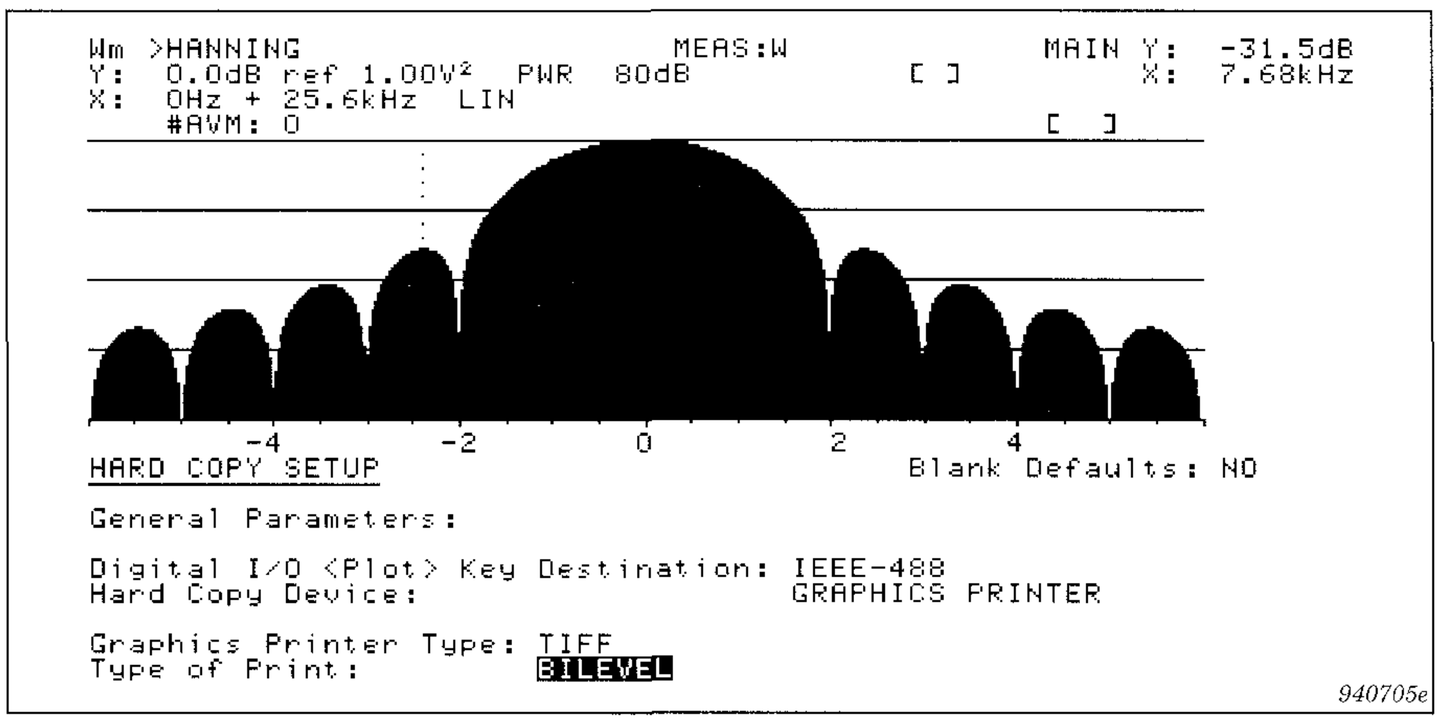

Fig. 7 Screen print as TIFF file using WordPerfect®

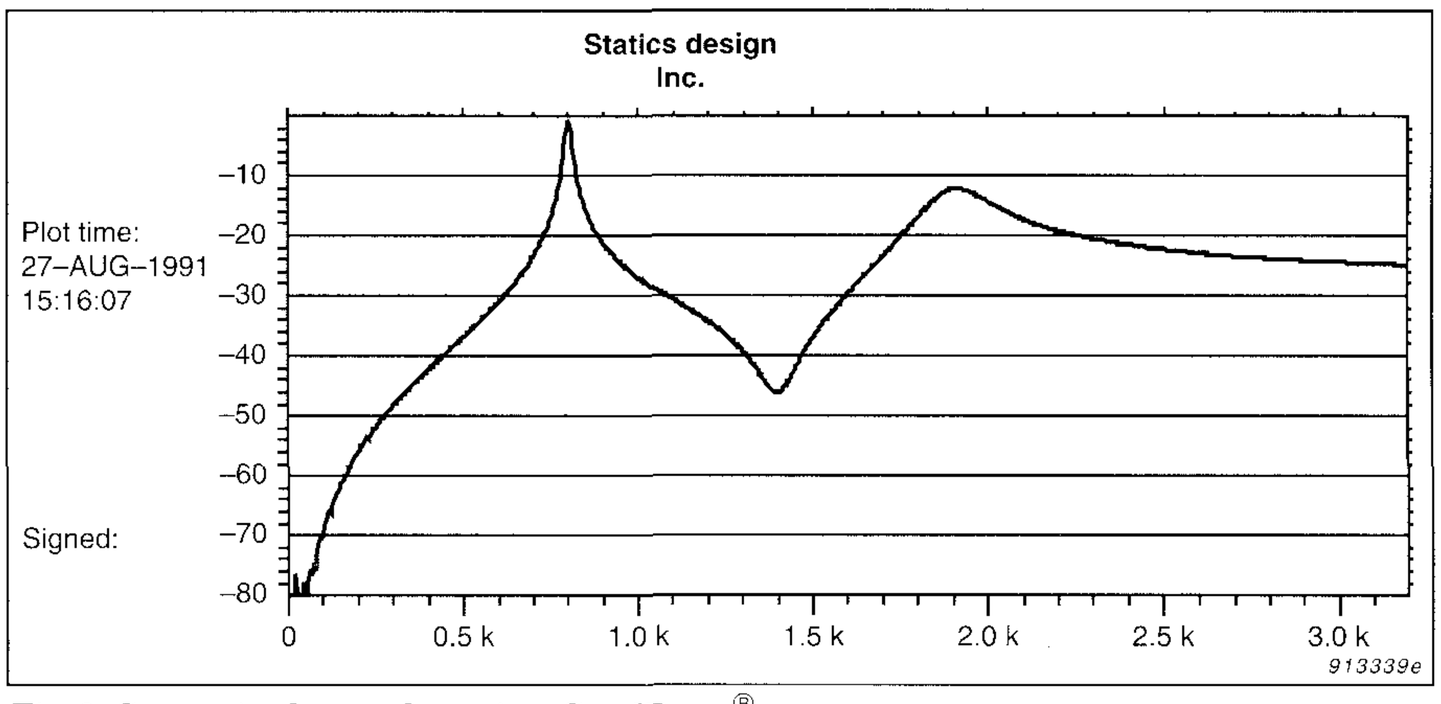

Fig. 8 Customized pen plot using CorelDraw®

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