Internal Data Transfer between Windows 3.1 / Excel and Vector Network Analyzer ZVR

Application Note 1EZ39_1E

Subject to change

22 January 1998, Albert Gleißner

Products:

ZVR

ZVRE

ZVRL

ROHDE&SCHWARZ

1 Summary

This Application Note describes the internal transfer of ZVR measurement data in Excel, carried out on the PC option of the ZVR, and the evaluation of the data in Excel tables. To start the data transfers, macros are implemented under Excel.

2 Introduction

As a basic requirement, option ZVR-B15 which enhances the ZVR by a PC function must be fitted. This option allows further processing of the measured data in the ZVR under DOS or Windows 3.1 programs. The ZVR is however controlled under a realtime operating system. Due to the complex hierarchy of the software components involved, the method of data exchange is of particular interest.

3 Software Structure of ZVR (Fig. 1)

ZVR uses the realtime operating system iRMX. The firmware is started upon booting the ZVR. In addition to the ZVR control proper, the firmware also comprises the data management and a parser which controls the communication via the IEC/IEEE bus. The parser is able to control the external IEC/IEEE bus and to process IEC/IEEE-bus commands and data internally via RSIB functions libraries. For the parser, communication via external IEC/IEEE bus or internal IEC/IEEE commands appears to be absolutely the same. In the case of internal data transfer the data are exchanged via a common memory and not via a bus. The memory is managed by the parser in a DDE job.

Note: The RSIB functions libraries have been developed by Rohde & Schwarz with a view to the National Instruments GPIB libraries. Therefore, the same function names are used (eg ibwrt) - however with the prefix "RSDLL".

Under iRMX it is possible to start DOS/Windows3.1 and also Excel in one shell. To communicate with the firmware, the Excel macros in the *ddedemo2.xls* file also access the RSIB libraries which use the common memory. Through the transfer of pointer addresses to this memory, data exchange is enabled between Excel and the firmware.

The procedure is similar to DDE (<u>D</u>ynamic <u>D</u>ata <u>E</u>xchange) that is normally used; in connection with this application the term DDE is therefore used as well.

The Excel macros are written in VisualBasic syntax. For access to the DLLs with the RSIB libraries a list of the functions contained in the DLLs is required. This list forms the header of the macros.
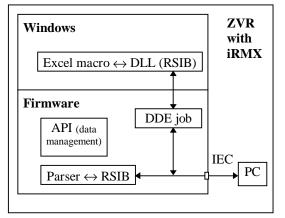

Fig. 1: Interleaving and interplay of individual software components

The data exchange route is as follows:

Windows/Excel macro $\Leftrightarrow$ access to DLLs (RSIB) $\Leftrightarrow$ common memory (management by DDE job or macro) $\Leftrightarrow$ parser (RSIB) $\Leftrightarrow$ rest of firmware.

4 Description of Macro Functions

The *ddedemo2.xls* file offers three macros with different functionality - *BFilHcopy, TraceExport, TraceRd*. Upon opening *ddedemo2.xls* in Excel , the macros can be viewed as follows: click on the pages *Module1, Module2* or *Module3* or click on *Extras $\Rightarrow$ Macro... $\Rightarrow$* (mark one of the three macros) $\Rightarrow$ *Edit.*

1. **BFilHcopy**
   This module automatically configures the ZVR for measurement of the transmission coefficient and group delay on the demo bandpass filter. A hardcopy of the displayed measurement results (traces) is then stored on the hard disk. This graphics file is read in by Excel. The disadvantage of this macro is that the measurement results are not available in Windows.

2. **TraceExport**
   Similar to BFilHcopy, but stores the traces in ASCII format. Further processing eg under Excel is then possible.

3. TraceRd

This macro allows the four S-parameters of the demo bandpass filter to be measured and displayed in Excel tables and graphs. The advantage of this macro is that it allows further processing of the measurement results that are available as raw data. For the *TraceRd* macro which serves for data transfer and calculation and plotting in Excel the following manual settings have to be made on ZVR:

PRESET

DISPLAY $\Rightarrow$ QUAD CHAN QUAD SPLIT

SWEEP $\Rightarrow$ COUPLED CHANNELS (on)

CENTER (2.22 GHz)

SPAN (100 MHz)

SWEEP $\Rightarrow$ NUMBER OF POINTS $\Rightarrow$ 51

CH1

FORMAT $\Rightarrow$ MAGNITUDE

MEAS $\Rightarrow$ S11

SCALE $\Rightarrow$ MAX VAL (0 dB)

SCALE $\Rightarrow$ MIN VAL (-20 dB)

CH2

FORMAT $\Rightarrow$ MAGNITUDE

MEAS $\Rightarrow$ S21

SCALE $\Rightarrow$ MAX VAL (0 dB)

SCALE $\Rightarrow$ MIN VAL (-120 dB)

CH3

FORMAT $\Rightarrow$ MAGNITUDE

MEAS $\Rightarrow$ S12

SCALE $\Rightarrow$ MAX VAL (0 dB)

SCALE $\Rightarrow$ MIN VAL (-120 dB)

CH4

FORMAT $\Rightarrow$ MAGNITUDE

MEAS $\Rightarrow$ S22

SCALE $\Rightarrow$ MAX VAL (0 dB)

SCALE $\Rightarrow$ MIN VAL (-20 dB)

Upon execution of the *TraceRd* macro, 51 values are read into four Excel tables (tables 1, 3, 5, 7) for each of the four channels. ZVR gives the real and imaginary component of the measurement results, the desired parameters being derived in Excel (in this example magnitude of the S-parameters). The results are graphically displayed in the next table (tables 1 to 8 contain existing values of the *TraceRd* macro as default values). All four graphs are simultaneously shown in table 16 and output on a printer. If there is no printer connected, printout can be aborted or ends with an error message.

Measurement parameters such as center frequency, span or number of points are fixed with constant values in the Excel macros; the above configuration on the ZVR therefore must be ad-

hered to. To enhance the functionality, the *ddedemo2.xls* program can of course be expanded. A list of all IEC/IEEE-bus commands is included in the ZVR manual. An Application Note on the IEC/IEEE-bus control of the ZVR is also available.

5 Installation and Execution

The key combination Alt - Print can be used to switch between display of measurement results and PC mode.

- The three DLLs - *vbrun300.dll, rsib.dll* and *rsdde.dll* - should be available in the ZVR firmware in directory *C:\RSIB*. Should one of the files be missing, it must be read in from the floppy disk. For the execution of a macro the DLLs must be available in directory *C:\Windows\System*.

- Copy the *ddedemo2.xls* into any directory in the *C:* partition on the hard disk.

- Start Excel, open *ddedemo2.xls*.

- For execution of the third macro (*TraceRd*), ZVR has to be configured manually first. The other two macros configure the ZVR automatically.

- Open the menu in Excel *Extras $\Rightarrow$ Macro...* and click on one of the three modules *BFilHcopy, TraceExport, TraceRd* and start it (*Execute* key).

  ddedemo2.xls contains standard tables and graphs for the third macro *TraceRd*. If another macro is executed, the cursor first has to be set into an empty table (tables 9 to 15) because of the preconfiguration. If *TraceRd* is to be executed next, the ZVR has to be reconfigured.

6 List of the Required Files

ddedemo2.xls

Excel table with values of the *TraceRd* macro and the macros *BFilHcopy, TraceExport, TraceRd.*

rsdde.dll, rsib.dll, vbrun300.dll

DLLs with RSIB functions for communication via the IEC/IEEE bus.

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22 January 1998

7 Further Application Notes

[1] O. Ostwald: 3-Port Measurements with Vector Network Analyzer ZVR, Appl. Note 1EZ26_1E.

[2] H.-G. Krekels: Automatic Calibration of Vector Network Analyzer ZVR, Appl. Note 1EZ30_1E.

[3] O. Ostwald: 4-Port Measurements with Vector Network Analyzer ZVR, Appl. Note 1EZ25_1E.

[4] T. Bednorz: Measurement Uncertainties for Vector Network Analysis, Appl. Note 1EZ29_1E.

[5] P. Kraus: Measurements on Frequency-Converting DUTs using Vector Network Analyzer ZVR, Appl. Note 1EZ32_1E.

[6] J. Ganzert: Accessing Measurement Data and Controlling the Vector Network Analyzer via DDE, Appl. Note 1EZ33_1E.

[7] J. Ganzert: File Transfer between Analyzers FSE or ZVR and PC using MS-DOS Interlink, Appl. Note 1EZ34_1E.

[8] O. Ostwald: Group and Phase Delay Measurements with Vector Network Analyzer ZVR, Appl. Note 1EZ35_1E.

[9] O. Ostwald: Multiport Measurements using Vector Network Analyzer, Appl. Note 1EZ37_1E.

[10] O. Ostwald: Frequently Asked Questions about Vector Network Analyzer ZVR, Appl. Note 1EZ38_3E.

[11] A. Gleißner: Internal Data Transfer between Windows 3.1 / Excel and Vector Network Analyzer ZVR, Appl. Note 1EZ39_1E.

[12] A. Gleißner: Power Calibration of Vector Network Analyzer ZVR, Appl. Note 1EZ41_2E

[13] O. Ostwald: Pulsed Measurements on GSM Amplifier SMD ICs with Vector Analyzer ZVR, Appl. Note 1EZ42_1E.

[14] O. Ostwald: Zeitbereichsmessungen mit dem Netzwerkanalysator ZVR, Appl. Note 1EZ44_1D.

8 Ordering Information

Order designation	Type	Frequency range	Order No.
Vector Network Analyzers (test sets included) *			
3-channel, unidirectional, 50 Ω, passive	ZVRL	9 kHz to 4 GHz	1043.0009.41
3-channel, bidirectional, 50 Ω, passive	ZVRE	9 kHz to 4 GHz	1043.0009.51
3-channel, bidirectional, 50 Ω, active	ZVRE	300 kHz to 4 GHz	1043.0009.52
4-channel, bidirectional, 50 Ω, passive	ZVR	9 kHz to 4 GHz	1043.0009.61
4-channel, bidirectional, 50 Ω, active	ZVR	300 kHz to 4 GHz	1043.0009.62
3-channel, bidirectional, 50 Ω, active	ZVCE	20 kHz to 8 GHz	1106.9020.50
4-channel, bidirectional, 50 Ω, active	ZVC	20 kHz to 8 GHz	1106.9020.60
Alternative Test Sets *			
75 Ω SWR Bridge for ZVRL (instead of 50 Ω) [1]			
75 Ω, passive	ZVR-A71	9 kHz to 4 GHz	1043.7690.18
75 Ω SWR Bridge Pairs for ZVRE and ZVR (instead of 50 Ω) [1]			
75 Ω, passive	ZVR-A75	9 kHz to 4 GHz	1043.7755.28
75 Ω, active	ZVR-A76	300 kHz to 4 GHz	1043.7755.29
Options			
AutoKal	ZVR-B1	0 to 8 GHz	1044.0625.02
Time Domain	ZVR-B2	same as analyzer	1044.1009.02
Mixer Measurements [2]	ZVR-B4	same as analyzer	1044.1215.02
Reference Channel Ports	ZVR-B6	same as analyzer	1044.1415.02
Power Calibration [3]	ZVR-B7	same as analyzer	1044.1544.02
3-Port Adapter	ZVR-B8	0 to 4 GHz	1086.0000.02
Virtual Embedding Networks [4]	ZVR-K9	same as analyzer	1106.8830.02
4-Port Adapter (2xSPDT)	ZVR-B14	0 to 4 GHz	1106.7510.02
4-Port Adapter (SP3T)	ZVR-B14	0 to 4 GHz	1106.7510.03
Controller (German) [5]	ZVR-B15	-	1044.0290.02
Controller (English) [5]	ZVR-B15	-	1044.0290.03
Ethernet BNC for ZVR-B15	FSE-B16	-	1073.5973.02
Ethernet AUI for ZVR-B15	FSE-B16	-	1073.5973.03
IEC/IEEE-Bus Interface for ZVR-B15	FSE-B17	-	1066.4017.02
Generator Step Attenuator PORT 1	ZVR-B21	same as analyzer	1044.0025.11
Generator Step Attenuator PORT 2 [6]	ZVR-B22	same as analyzer	1044.0025.21
Receiver Step Attenuator PORT 1	ZVR-B23	same as analyzer	1044.0025.12
Receiver Step Attenuator PORT 2	ZVR-B24	same as analyzer	1044.0025.22
External Measurements, 50 Ω [7]	ZVR-B25	10 Hz to 4 GHz (ZVR/E/L) 20 kHz to 8 GHz (ZVC/E)	1044.0460.02

[1] To be ordered together with the analyzer.
[2] Harmonics measurements included.
[3] Power meter and sensor required.
[4] Only for ZVR or ZVC with ZVR-B15.
[5] DOS, Windows 3.11, keyboard and mouse included.
[6] For ZVR or ZVC only.
[7] Step attenuators required.

* Note:
Active test sets, in contrast to passive test sets, comprise internal bias networks, eg to supply DUTs.