



## Trace32 system for E-GoldRadio

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# Debugging and developing using Trace32 by Lauterbach

## Support

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- Trace32 environment support for E-GoldRadio is based on JTAG interface and Monitor resources stored internally in Internal RAM
- Link between target and host application is established by:
  - PowerTrace LA-7707
  - cable LA-7755 for OCDS
  - cable LA-7857 for peripherals
- Trace32 support is disabled during boot for security reasons

## Features

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- Allow access to every addressable resource from inside E- GoldRadio
- Allow access to external accesses by hw sniffing on address and data buses.
- Allow manual suspension of execution or predetermined breakpoint setting ( up to 4 ) by TARGET sw routine located at 0x18000 (start of internal RAM)

## Environment configuration : abs (1)

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- TARGET related debug information are stored in \*.abs file (IEEE 695) generated at the end of build chain.
- IEEE166.EXE is used
  - TASKING C166/ST10 IEEE-695 formatter v7.5r5 Build 049
- The generation takes place in tasking166.mk

### createabs:

```
${EMU_CONV} ${MAKEDIR}/${PROJECTNAME}.${AXFFILEEXT}  
${MAKEDIR}/${PROJECTNAME}.abs
```

- Macro definition
  - EMU\_CONV = ieee166
- Debug level is set using proper debug switches.
  - **make -r BUILDMODE=DEBUG** to get a build with debugging information

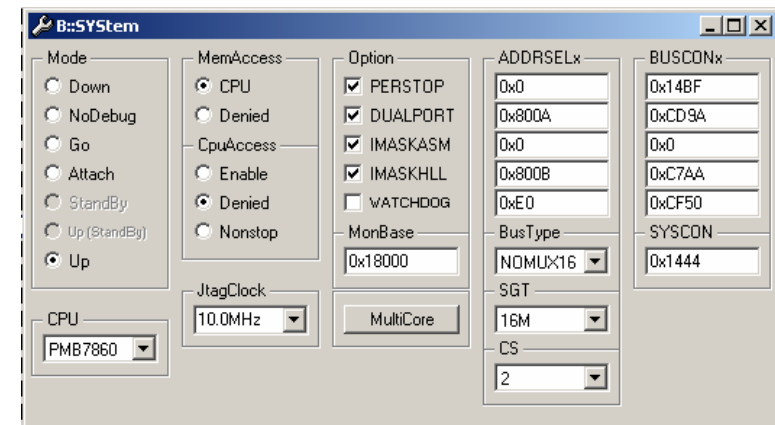
## Environment configuration : abs (2)

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- Debug information is generated only for those file that are rebuilt (obj not present or not up to date) when IEE166.exe is called
  - it is possible to set debug options only for a limited set of files by deleting the objs related and restarting compilation with debug flag set. This speeds up debugging process since it decreases considerably the time involved in abs generation.

## Environment configuration : \*.cmm (1)

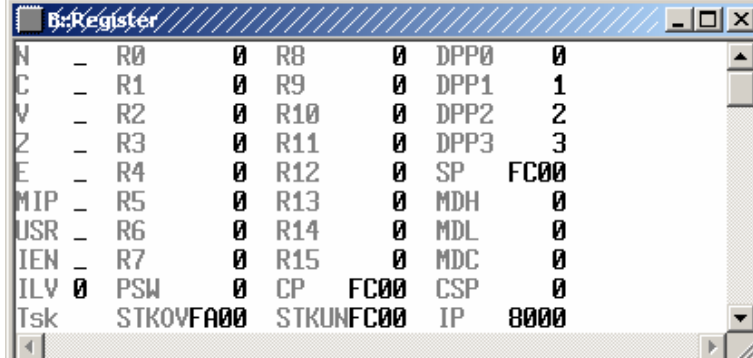
- Configuration is based on a set of \*.cmm scripts
- Main cmm file sets HOST system up (setting are used by Trace32 and does not affect TARGET system registers)
  - SYStem.Option MONBASE 0x18000
    - monitor routine address
  - SYStem.CPU PMB7860
    - System is EGoldLite/EGoldRadio
  - SYStem.Option or ( sys.o in short format ) is equivalent to manual set in B::System dialog



## Environment configuration : \*.cmm (2)

### Main cmm file sets TARGET system up

- Data.Set 0xff0c %w 0x05be ;  
BUSCON0
  - Every register (and peripheral) can be set by Data.Set (or d.s)
- Data.Set 0x18000 %b 0xec 0xf0  
0xec 0x03 0xe6 0x03 0x03 0x00  
0xcc 0x00 0xf2 0xf0 0xfc 0xf0 0x66  
0xf0
  - The monitor routine is loaded to internal RAM
- R.S CSP 00
- R.S IP 8000
  - Registers are properly set
- Register.Set or ( r.s in short format )  
is equivalent to manual set in  
B::Register dialog



B::Register							
N	-	R0	0	R8	0	DPP0	0
C	-	R1	0	R9	0	DPP1	1
V	-	R2	0	R10	0	DPP2	2
Z	-	R3	0	R11	0	DPP3	3
E	-	R4	0	R12	0	SP	FC00
MIP	-	R5	0	R13	0	MDH	0
USR	-	R6	0	R14	0	MDL	0
IEN	-	R7	0	R15	0	MDC	0
ILV	0	PSW	0	CP	FC00	CSP	0
Tsk		STKOV	FA00	STKUN	FC00	IP	8000

## Environment configuration : \*.cmm (3)

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- Main cmm loads debug informations stored in abs file
  - d.load.i ..\..\..\mmi\_C166\_mmi\_GPRSEGL\_RELEASE.abs /nocode /cfront
    - Path is relative to the path of the cmm script
  - y.spath + ..\..\..\..\inc\stack\target
    - Source symbol path for browse is added to current path
  - do ..\basicmmii.cmm
    - Other cmm scripts are executed by do batch command
  - d.v %SYMBOL.LONG register(sp) /TRACK
    - Stack pointer is accessed in order to show current stack fifo
    - Data.View (or short form d.v) enables runtime access to values)



## Method Analyzer

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- To use the [TRACE32-PowerTrace](#), TRACE32 development tool must be equipped with a physical trace memory with a trace depth of 16M frames or more.
- The intention of the method Analyzer is to provide a real-time trace to sample the program and data flow
  - While the user program is running the program and data flow is sampled into the trace memory
  - No influence on the real-time behavior

## Method Analyzer: Configuration (1)

The screenshot shows the 'B::Trace' configuration window. The 'METHOD' tab is selected, with 'Analyzer' chosen. The 'state' section has 'Arm' selected. The 'used' section shows a memory address '16777216.' and a 'SIZE' of '16777216.'. The 'TDelay' section has a value of '0.' and a '0%' dropdown. The 'ACCESS' section has an empty dropdown. The 'commands' section includes buttons for 'RESet', 'Init' (selected), 'TEST', and 'List', along with checkboxes for 'AutoArm' (checked), 'AutoInit', and 'AutoTEST'. The 'Mode' section has 'Fifo' selected, and 'BusTrace' is also selected. Other modes like 'Stack', 'Leach', 'ClockTrace', 'FlowTrace', 'Poststore', 'PostTrace', and 'SLAVE' (checked) are also visible. The 'Threshold' section has 'VCC' selected and a value of '0.94'. The 'probe' section has 'TERMination' checked.

**B::Trace**

**METHOD**

☒ Analyzer ☐ Logger ☐ SNOOPer ☐ Onchip

**state**

☐ DISable  
☐ OFF  
☒ Arm  
☐ trigger  
☐ break

**used**

16777216.  
SIZE  
16777216.

**TDelay**

0.  
0% ▼

**ACCESS**

▼

**commands**

RESet  
⊗ Init  
TEST  
List

☒ AutoArm  
☐ AutoInit  
☐ AutoTEST

**Mode**

☒ Fifo  
☐ Stack  
☐ Leach  
☒ BusTrace  
☐ ClockTrace  
☐ FlowTrace  
☐ Poststore  
☐ PostTrace  
☒ SLAVE

**Threshold**

☒ VCC  
☐ CLOCK  
0.94 ▼

**probe**

☒ TERMination

## Method Analyzer: Configuration (2)

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### **State** Displays current trace status

- **OFF:** Indicates that trace memory and trigger unit are deactivated. The trace memory contents can be read.
- **Arm:** Indicates that trace is activated (for sampling and triggering events). A read out is impossible
- **break:** Indicates that the specified trigger event in the trigger unit has been encountered. At the same time, the trace is in OFF state for read out
- **Arm:** The trace buffer and the trigger unit is prepared for recording and triggering

### **Command**

- **Reset:** All functions of the trace are reset to its default settings. The trace memory and the trigger unit are cleared. All user defined presets are cleared too
- **Init:** Trace memory contents are erased before each program execution and previous records are no longer visible. The trigger unit is returned to its initial setting
- **Test:** The same as executing the commands OFF, Init and Arm
- **AutoArm:** If set the "Arm" command will be executed automatically, when the user program is started. After program stops the trace will be switched into the OFF state automatically
- **AutoInit:** The Init command will be executed automatically, when the user program is started. Trace memory contents are erased before each program execution and previous records are no longer visible

## Method Analyzer: Configuration (3)

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**Used** Displays the actual number of entries in the trace buffer while the recording is running

### Mode

- **Fifo:** If the trace is full, new records will overwrite older records. The trace records always the last cycles before the break
- **Stack:** If the trace is full recording will be stopped. The trace always records the first cycles after starting the trace
- **Slave:** trace memory and the trigger unit work during user program execution

**TDelay** Defines the trigger delay in entries or percentage of trace depth

**Threshold** used to optimize the threshold level for the trace lines in order to avoid indefinable FLOWERRORS

- **VCC:** The preprocessor and the TRACE32 software measure the VCC of the target. 1/2 VCC is then automatically used as the threshold level for the trace lines
- **CLOCK:** The threshold level is changed until the duty cycle of the trace clock reaches a ratio of 1:1. This setting is only recommended if the trace clock has a duty cycle of 1:1
- **Termination:** By default the trace line termination of the preprocessor is used. Indefinable FLOWERRORS may occur if the output drivers of the CPU are not strong enough. In this case it is recommended to switch the trace line termination OFF

## Method Analyzer: List

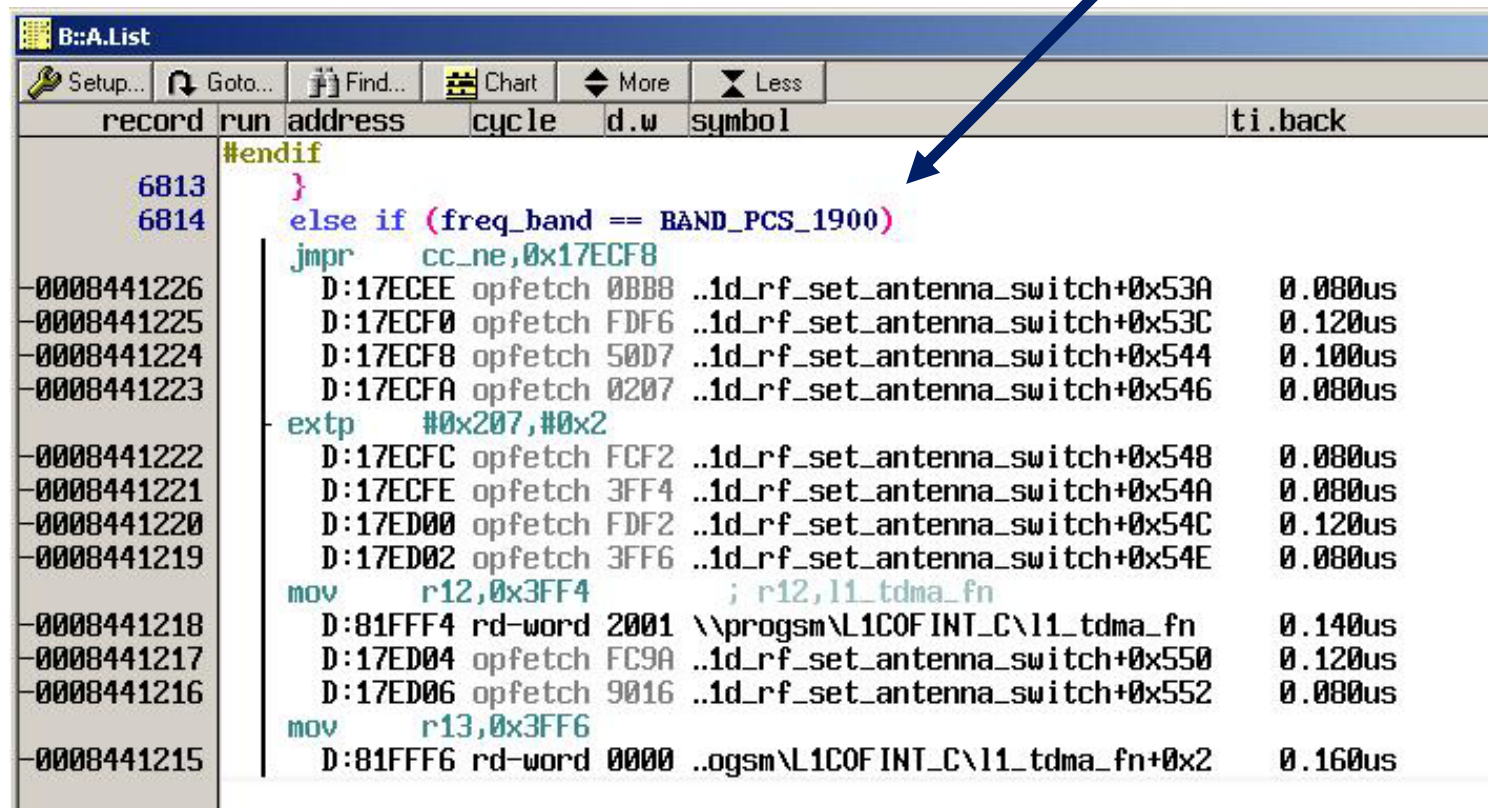
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- List command is used to display the History buffer
- Listing the current trace memory contents is only possible when the trace status is set to OFF. Otherwise the list window is frozen and displays previous memory contents.
- If no parameters are specified, a predefined set of items will appear in the window in an order as defined by the command `SETUP.ALIST`

## Method Analyzer: List Items (1)

- **DEFault:** Default selections The contents of the default selection can be configured with the command **SETUP.ALIST**
  - Command: **Analyzer.List**

**Default data**

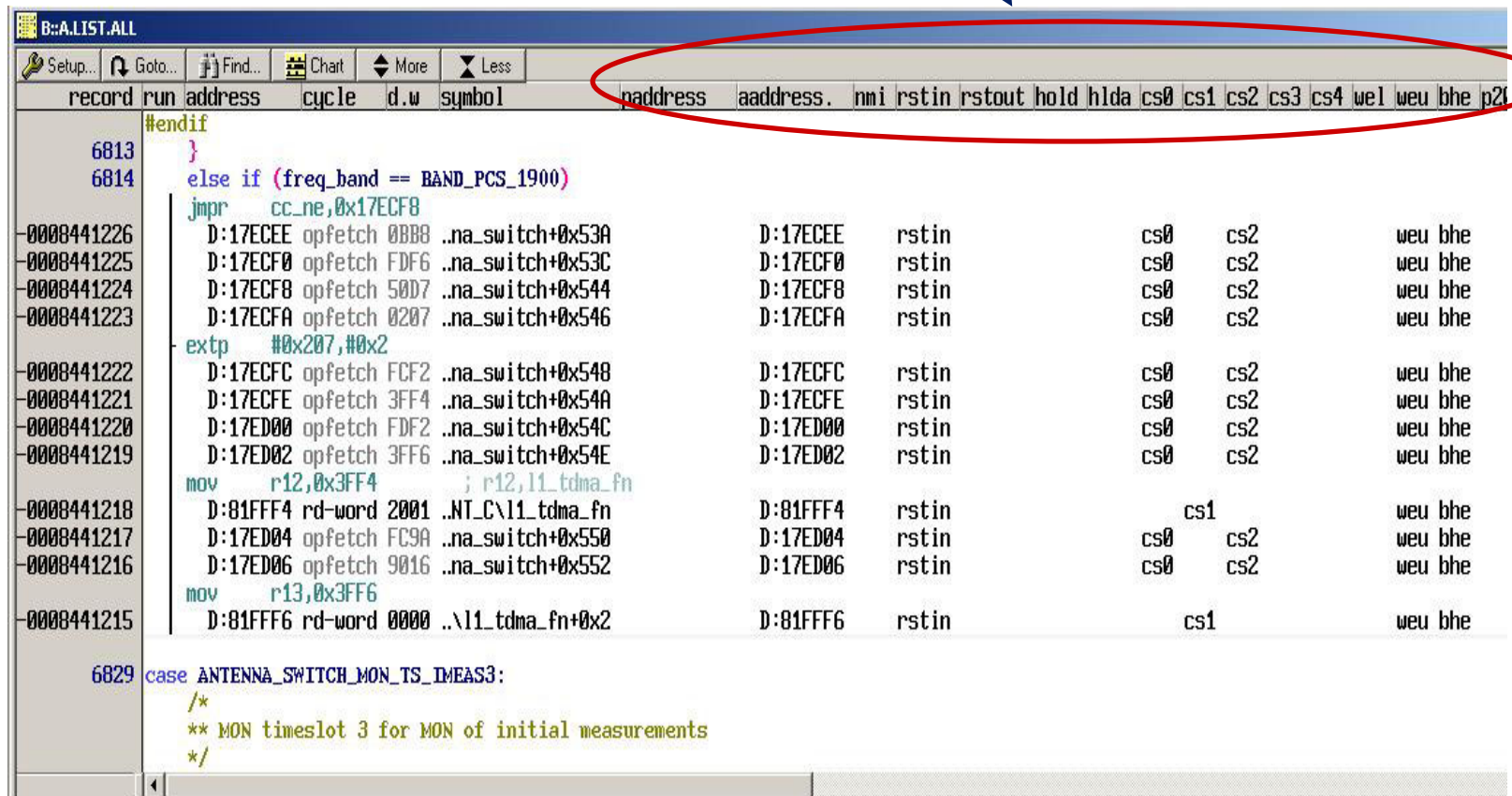


record	run	address	cycle	d.w	symbol	ti.back
		#endif				
6813		}				
6814		else if (freq_band == BAND_PCS_1900)				
		jmp	cc_ne,0x17ECF8			
0008441226		D:17ECF8 opfetch	0BB8		..1d_rf_set_antenna_switch+0x53A	0.080us
0008441225		D:17ECF0 opfetch	FDF6		..1d_rf_set_antenna_switch+0x53C	0.120us
0008441224		D:17ECF8 opfetch	50D7		..1d_rf_set_antenna_switch+0x544	0.100us
0008441223		D:17ECFA opfetch	0207		..1d_rf_set_antenna_switch+0x546	0.080us
		extp	#0x207,#0x2			
0008441222		D:17ECFC opfetch	FCF2		..1d_rf_set_antenna_switch+0x548	0.080us
0008441221		D:17ECFE opfetch	3FF4		..1d_rf_set_antenna_switch+0x54A	0.080us
0008441220		D:17ED00 opfetch	FDF2		..1d_rf_set_antenna_switch+0x54C	0.120us
0008441219		D:17ED02 opfetch	3FF6		..1d_rf_set_antenna_switch+0x54E	0.080us
		mov	r12,0x3FF4		; r12,l1_tdma_fn	
0008441218		D:81FFF4 rd-word	2001		\\progsml1C0FINT_C\l1_tdma_fn	0.140us
0008441217		D:17ED04 opfetch	FC9A		..1d_rf_set_antenna_switch+0x550	0.120us
0008441216		D:17ED06 opfetch	9016		..1d_rf_set_antenna_switch+0x552	0.080us
		mov	r13,0x3FF6			
0008441215		D:81FFF6 rd-word	0000		..ogsm\L1C0FINT_C\l1_tdma_fn+0x2	0.160us

## Method Analyzer: List Items (2)

- **ALL:** Select all recorded data
  - Command: `Analyzer.List.ALL`

**All record data**



The screenshot shows the Method Analyzer interface with the 'ALL' command selected in the toolbar. A red oval highlights the toolbar area, and a blue arrow points to the text 'All record data'.

record	run	address	cycle	d.w	symbol	naddress	aaddress.	nmi	rstin	rstout	hold	hlida	cs0	cs1	cs2	cs3	cs4	we1	weu	bhe	p2f
6813					#endif																
6814					else if (freq_band == BAND_PCS_1900)																
					jmp cc_ne,0x17ECF8																
0008441226		D:17ECF0	opfetch	0BB8	..na_switch+0x53A	D:17ECF0			rstin				cs0		cs2				weu	bhe	
0008441225		D:17ECF0	opfetch	FDF6	..na_switch+0x53C	D:17ECF0			rstin				cs0		cs2				weu	bhe	
0008441224		D:17ECF8	opfetch	50D7	..na_switch+0x544	D:17ECF8			rstin				cs0		cs2				weu	bhe	
0008441223		D:17ECFA	opfetch	0207	..na_switch+0x546	D:17ECFA			rstin				cs0		cs2				weu	bhe	
			extp	#0x207,#0x2																	
0008441222		D:17ECFC	opfetch	FCF2	..na_switch+0x548	D:17ECFC			rstin				cs0		cs2				weu	bhe	
0008441221		D:17ECFE	opfetch	3FF4	..na_switch+0x54A	D:17ECFE			rstin				cs0		cs2				weu	bhe	
0008441220		D:17ED00	opfetch	FDF2	..na_switch+0x54C	D:17ED00			rstin				cs0		cs2				weu	bhe	
0008441219		D:17ED02	opfetch	3FF6	..na_switch+0x54E	D:17ED02			rstin				cs0		cs2				weu	bhe	
			mov	r12,0x3FF4	; r12,l1_tdma_fn																
0008441218		D:81FFF4	rd-word	2001	..NT_C\l1_tdma_fn	D:81FFF4			rstin					cs1					weu	bhe	
0008441217		D:17ED04	opfetch	FC9A	..na_switch+0x550	D:17ED04			rstin				cs0		cs2				weu	bhe	
0008441216		D:17ED06	opfetch	9016	..na_switch+0x552	D:17ED06			rstin				cs0		cs2				weu	bhe	
			mov	r13,0x3FF6																	
0008441215		D:81FFF6	rd-word	0000	..l1_tdma_fn+0x2	D:81FFF6			rstin					cs1					weu	bhe	
6829			case	ANTENNA_SWITCH_MON_TS_MEAS3:																	
			/*																		
			**	MON timeslot 3 for MON of initial measurements																	
			*/																		



## Method Analyzer: List Items (3)

- **Address:** Show only the CPU address
  - Command: `Analyzer.List.ADDRESS`

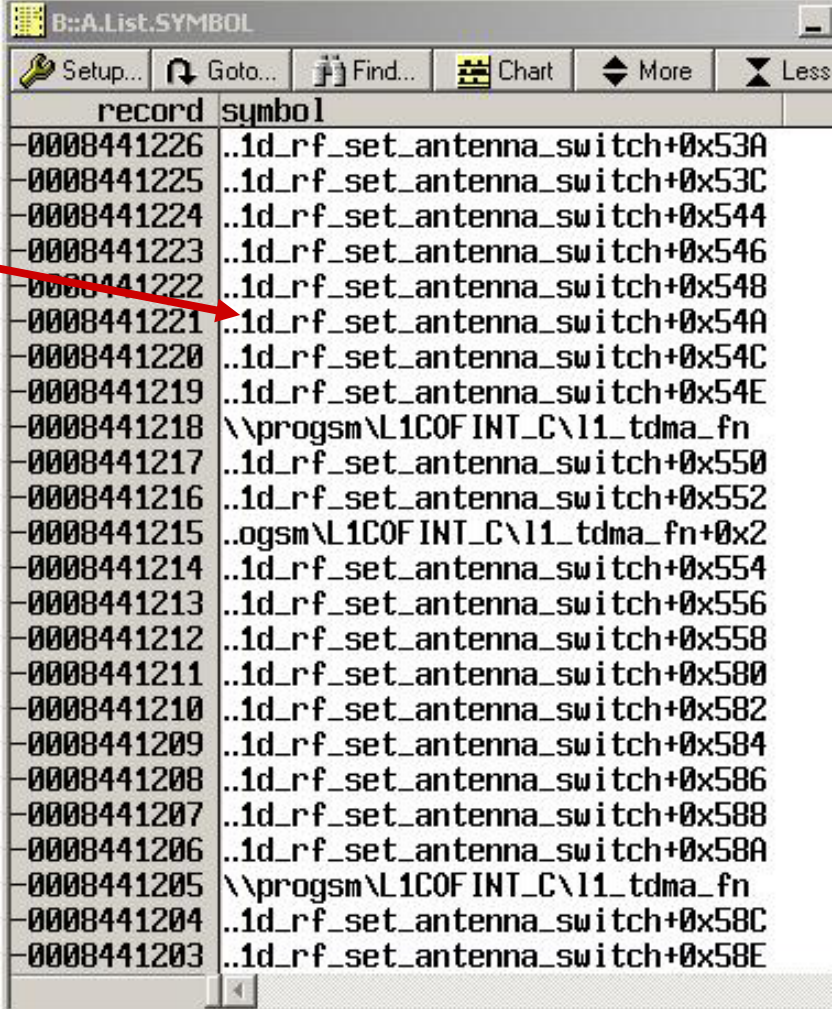


record	address
0008441226	D:17ECE
0008441225	D:17ECF0
0008441224	D:17ECF8
0008441223	D:17ECFA
0008441222	D:17ECFC
0008441221	D:17ECFE
0008441220	D:17ED00
0008441219	D:17ED02
0008441218	D:81FFF4
0008441217	D:17ED04
0008441216	D:17ED06
0008441215	D:81FFF6
0008441214	D:17ED08
0008441213	D:17ED0A
0008441212	D:17ED0C
0008441211	D:17ED34
0008441210	D:17ED36
0008441209	D:17ED38
0008441208	D:17ED3A
0008441207	D:17ED3C
0008441206	D:17ED3E
0008441205	D:81FFF4
0008441204	D:17ED40
0008441203	D:17ED42



## Method Analyzer: List Items (4)

- **Symbol:** Show only the Symbolic address with path and offset
  - Command:  
`Analyzer.List.SYMBOL`

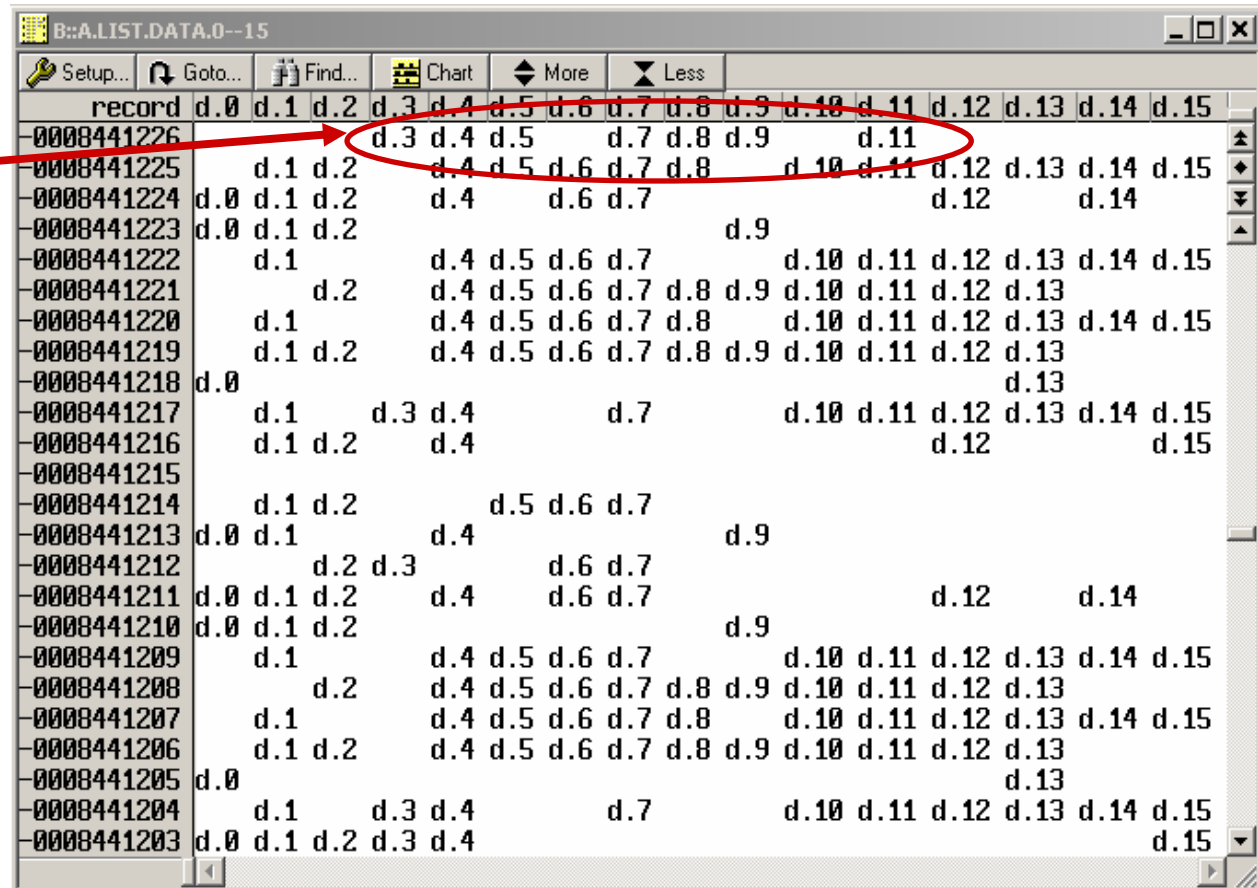


record	symbol
0008441226	..1d_rf_set_antenna_switch+0x53A
0008441225	..1d_rf_set_antenna_switch+0x53C
0008441224	..1d_rf_set_antenna_switch+0x544
0008441223	..1d_rf_set_antenna_switch+0x546
0008441222	..1d_rf_set_antenna_switch+0x548
0008441221	..1d_rf_set_antenna_switch+0x54A
0008441220	..1d_rf_set_antenna_switch+0x54C
0008441219	..1d_rf_set_antenna_switch+0x54E
0008441218	\\progs\m\L1C0FINT_C\l1_tdma_fn
0008441217	..1d_rf_set_antenna_switch+0x550
0008441216	..1d_rf_set_antenna_switch+0x552
0008441215	..ogsm\L1C0FINT_C\l1_tdma_fn+0x2
0008441214	..1d_rf_set_antenna_switch+0x554
0008441213	..1d_rf_set_antenna_switch+0x556
0008441212	..1d_rf_set_antenna_switch+0x558
0008441211	..1d_rf_set_antenna_switch+0x580
0008441210	..1d_rf_set_antenna_switch+0x582
0008441209	..1d_rf_set_antenna_switch+0x584
0008441208	..1d_rf_set_antenna_switch+0x586
0008441207	..1d_rf_set_antenna_switch+0x588
0008441206	..1d_rf_set_antenna_switch+0x58A
0008441205	\\progs\m\L1C0FINT_C\l1_tdma_fn
0008441204	..1d_rf_set_antenna_switch+0x58C
0008441203	..1d_rf_set_antenna_switch+0x58E

## Method Analyzer: List Items (5)

- **Data.0--15:** Show the CPU data bits 0 to 15 as single bits (16 bit processor)
  - Command `Analyzer.List.DATA.0--15`

**Data 0BB8**



record	d.0	d.1	d.2	d.3	d.4	d.5	d.6	d.7	d.8	d.9	d.10	d.11	d.12	d.13	d.14	d.15
0008441226				d.3	d.4	d.5		d.7	d.8	d.9		d.11				
0008441225		d.1	d.2		d.4	d.5	d.6	d.7	d.8		d.10	d.11	d.12	d.13	d.14	d.15
0008441224	d.0	d.1	d.2		d.4		d.6	d.7					d.12		d.14	
0008441223	d.0	d.1	d.2							d.9						
0008441222		d.1			d.4	d.5	d.6	d.7			d.10	d.11	d.12	d.13	d.14	d.15
0008441221			d.2		d.4	d.5	d.6	d.7	d.8	d.9	d.10	d.11	d.12	d.13		
0008441220		d.1			d.4	d.5	d.6	d.7	d.8		d.10	d.11	d.12	d.13	d.14	d.15
0008441219		d.1	d.2		d.4	d.5	d.6	d.7	d.8	d.9	d.10	d.11	d.12	d.13		
0008441218	d.0													d.13		
0008441217		d.1		d.3	d.4			d.7			d.10	d.11	d.12	d.13	d.14	d.15
0008441216		d.1	d.2		d.4								d.12			d.15
0008441215																
0008441214		d.1	d.2			d.5	d.6	d.7								
0008441213	d.0	d.1			d.4					d.9						
0008441212			d.2	d.3			d.6	d.7								
0008441211	d.0	d.1	d.2		d.4		d.6	d.7					d.12		d.14	
0008441210	d.0	d.1	d.2							d.9						
0008441209		d.1			d.4	d.5	d.6	d.7			d.10	d.11	d.12	d.13	d.14	d.15
0008441208			d.2		d.4	d.5	d.6	d.7	d.8	d.9	d.10	d.11	d.12	d.13		
0008441207		d.1			d.4	d.5	d.6	d.7	d.8		d.10	d.11	d.12	d.13	d.14	d.15
0008441206		d.1	d.2		d.4	d.5	d.6	d.7	d.8	d.9	d.10	d.11	d.12	d.13		
0008441205	d.0													d.13		
0008441204		d.1		d.3	d.4			d.7			d.10	d.11	d.12	d.13	d.14	d.15
0008441203	d.0	d.1	d.2	d.3	d.4											d.15

## Method Analyzer: List Items (6)

### ■ Time

- Command: `Analyzer.List.DEFAULT ti.back ti.zero ti.ref ti.fore`

B::A.List.DEFAULT ti.zero ti.ref ti.fore									
record	run	address	cycle	d.w	symbol	ti.back	ti.zero	ti.ref	ti.fore
6813		}							
6814		else if (freq_band == BAND_PCS_1900)							
		jmprr cc_ne,0x17ECF8							
-0008441226		D:17ECE0 opfetch 0BB8			..1d_rf_set_antenna_switch+0x53A	0.080us	89.501ks	-1.580s	0.120us
-0008441225		D:17ECF0 opfetch FDF6			..1d_rf_set_antenna_switch+0x53C	0.120us	89.501ks	-1.580s	0.100us
-0008441224		D:17ECF8 opfetch 50D7			..1d_rf_set_antenna_switch+0x544	0.100us	89.501ks	-1.580s	0.080us
-0008441223		D:17ECFA opfetch 0207			..1d_rf_set_antenna_switch+0x546	0.080us	89.501ks	-1.580s	0.080us
		extp #0x207,#0x2							
-0008441222		D:17ECFC opfetch FCF2			..1d_rf_set_antenna_switch+0x548	0.080us	89.501ks	-1.580s	0.080us
-0008441221		D:17ECFE opfetch 3FF4			..1d_rf_set_antenna_switch+0x54A	0.080us	89.501ks	-1.580s	0.120us
-0008441220		D:17ED00 opfetch FDF2			..1d_rf_set_antenna_switch+0x54C	0.120us	89.501ks	-1.580s	0.080us
-0008441219		D:17ED02 opfetch 3FF6			..1d_rf_set_antenna_switch+0x54E	0.080us	89.501ks	-1.580s	0.140us
		mov r12,0x3FF4 ; r12,l1_tdma_fn							
-0008441218		D:81FFF4 rd-word 2001			\\progs\m\l1COFININT_C\l1_tdma_fn	0.140us	89.501ks	-1.580s	0.120us
-0008441217		D:17ED04 opfetch FC9A			..1d_rf_set_antenna_switch+0x550	0.120us	89.501ks	-1.580s	0.080us
-0008441216		D:17ED06 opfetch 9016			..1d_rf_set_antenna_switch+0x552	0.080us	89.501ks	-1.580s	0.160us
		mov r13,0x3FF6							
-0008441215		D:81FFF6 rd-word 0000			..ogs\m\l1COFININT_C\l1_tdma_fn+0x2	0.160us	89.501ks	-1.580s	0.100us



## Method Analyzer: List Items (7)

### ■ Time: Set Ti.REF

B::A.List.DEFAULT ti.zero ti.ref ti.fore									
record	run	address	cycle	d.w	symbol	ti.back	ti.zero	ti.ref	ti.fore
6813		}							
6814		else if (freq_band == BAND_PCS_1900)							
		jmprr cc_ne,0x17ECF8							
-0008441226		D:17ECF8 opfetch 0BB8 ..1d_rf_set_antenna_switch+0x53A				0.080us	-1.160us	-0.660us	0.120us
-0008441225		D:17ECF0 opfetch FDF6 ..1d_rf_set_antenna_switch+0x53C				0.120us	-1.040us	-0.540us	0.100us
-0008441224		D:17ECF8 opfetch 50D7 ..1d_rf_set_antenna_switch+0x544				0.100us	-0.940us	-0.440us	0.080us
-0008441223		D:17ECFA opfetch 0207 ..1d_rf_set_antenna_switch+0x546				0.080us	-0.860us	-0.360us	0.080us
		extp #0x207,#0x2							
-0008441222		D:17ECFC opfetch FCF2 ..1d_rf_set_antenna_switch+0x548				0.080us	-0.780us	-0.280us	0.080us
-0008441221		D:17ECFE opfetch 3FF4 ..1d_rf_set_antenna_switch+0x54A				0.080us	-0.700us	-0.200us	0.120us
-0008441220		D:17ED00 opfetch FDF2 ..1d_rf_set_antenna_switch+0x54C				0.120us	-0.580us	-0.080us	0.080us
-0008441219		D:17ED02 opfetch 3FF6 ..1d_rf_set_antenna_switch+0x54E				0.080us	-0.500us	0.000us	0.140us
		mov r12,0x3FF4 ; r12,l1_tdma_fn							
-0008441218		D:81FFF4 rd-word 2001 \progs\11COFINT_C\l1_tdma_fn				0.140us	-0.360us	0.140us	
-0008441217		D:17ED04 opfetch FC9A ..1d_rf_set_antenna_switch+0x550				0.120us	-0.240us	0.260us	
-0008441216		D:17ED06 opfetch 9016 ..1d_rf_set_antenna_switch+0x552				0.080us	-0.160us	0.340us	
		mov r13,0x3FF6							
-0008441215		D:81FFF6 rd-word 0000 ..ogsm\11COFINT_C\l1_tdma_fn+0x2				0.160us	0.000us	0.560us	

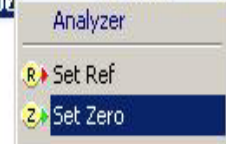


**Set ti.ref**

## Method Analyzer: List Items (8)

### ■ Time: Set Ti.zero

B::A.List.DEFAULT ti.zero ti.ref ti.fore									
record	run	address	cycle	d.w	symbol	ti.back	ti.zero	ti.ref	ti.fore
6813		}							
6814		else if (freq_band == BAND_PCS_1900)							
		jmp  cc_ne,0x17ECF8							
-0008441226		D:17ECF8 opfetch 0BB8 ..1d_rf_set_antenna_switch+0x53A				0.080us	-1.160us	-1.160us	0.120us
-0008441225		D:17ECF8 opfetch FDF6 ..1d_rf_set_antenna_switch+0x53C				0.120us	-1.040us	-1.040us	0.100us
-0008441224		D:17ECF8 opfetch 50D7 ..1d_rf_set_antenna_switch+0x544				0.100us	-0.940us	-0.940us	0.080us
-0008441223		D:17ECFA opfetch 0207 ..1d_rf_set_antenna_switch+0x546				0.080us	-0.860us	-0.860us	0.080us
		extp  #0x207,#0x2							
-0008441222		D:17ECFC opfetch FCF2 ..1d_rf_set_antenna_switch+0x548				0.080us	-0.780us	-0.780us	0.080us
-0008441221		D:17ECFE opfetch 3FF4 ..1d_rf_set_antenna_switch+0x54A				0.080us	-0.700us	-0.700us	0.120us
-0008441220		D:17ED00 opfetch FDF2 ..1d_rf_set_antenna_switch+0x54C				0.120us	-0.580us	-0.580us	0.080us
-0008441219		D:17ED02 opfetch 3FF6 ..1d_rf_set_antenna_switch+0x54E				0.080us	-0.500us	-0.500us	0.140us
		mov  r12,0x3FF4 ; r12,l1_tdma_fn							
-0008441218		D:81FFF4 rd-word 2001 \progsml1COFINT_C\l1_tdma_fn				0.140us	-0.360us	-0.360us	0.120us
-0008441217		D:17ED04 opfetch FC9A ..1d_rf_set_antenna_switch+0x550				0.120us	-0.240us	-0.240us	0.080us
-0008441216		D:17ED06 opfetch 9016 ..1d_rf_set_antenna_switch+0x552				0.080us	-0.160us	-0.160us	0.160us
		mov  r13,0x3FF6							
-0008441215		D:81FFF6 rd-word 0000 ..ogsm\l1COFINT_C\l1_tdma_fn+0x2-				0.160us	0.000	0.000	0.100us
6829		case ANTENNA_SWITCH_MON_TS_MEAS3:							
		/*							
		** MON timeslot 3 for MON of initial measurements							

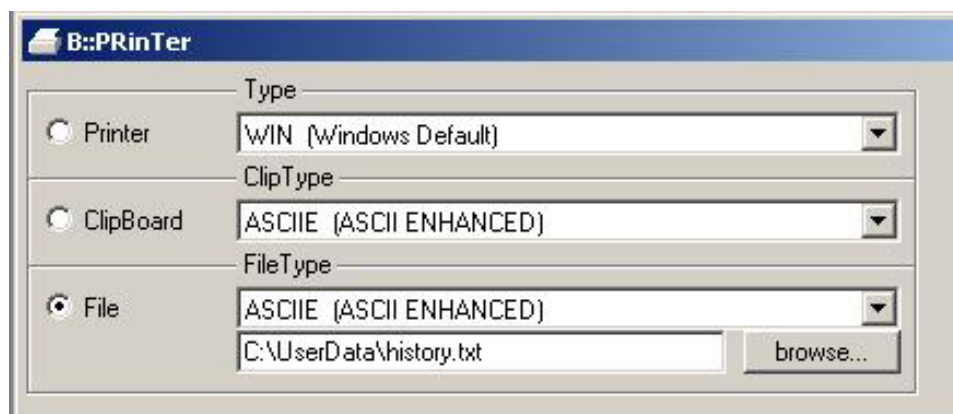


Set ti.zero

## Method Analyzer: Storing history buffer on file (1)

---

### 1. Configure the file type and file name



### 2. Use the command:

`winprint.[windows name] (Start index)--(End index) [param]`

Note! Index is in HEX format. To express it in DEC format is needed to insert "." at the end of index number

## Method Analyzer: Storing history buffer on file (2)

- E.g.

Store the history buffer from -2000 to -1000

winprint. Analyzer.List (-2000.)--(-1000.) Default

Dec format

Store the Default  
params

- Store only address, d.w and symbol from -8192 to -4096

winprint. Analyzer.List (-2000)--(-1000) address d.w symbol

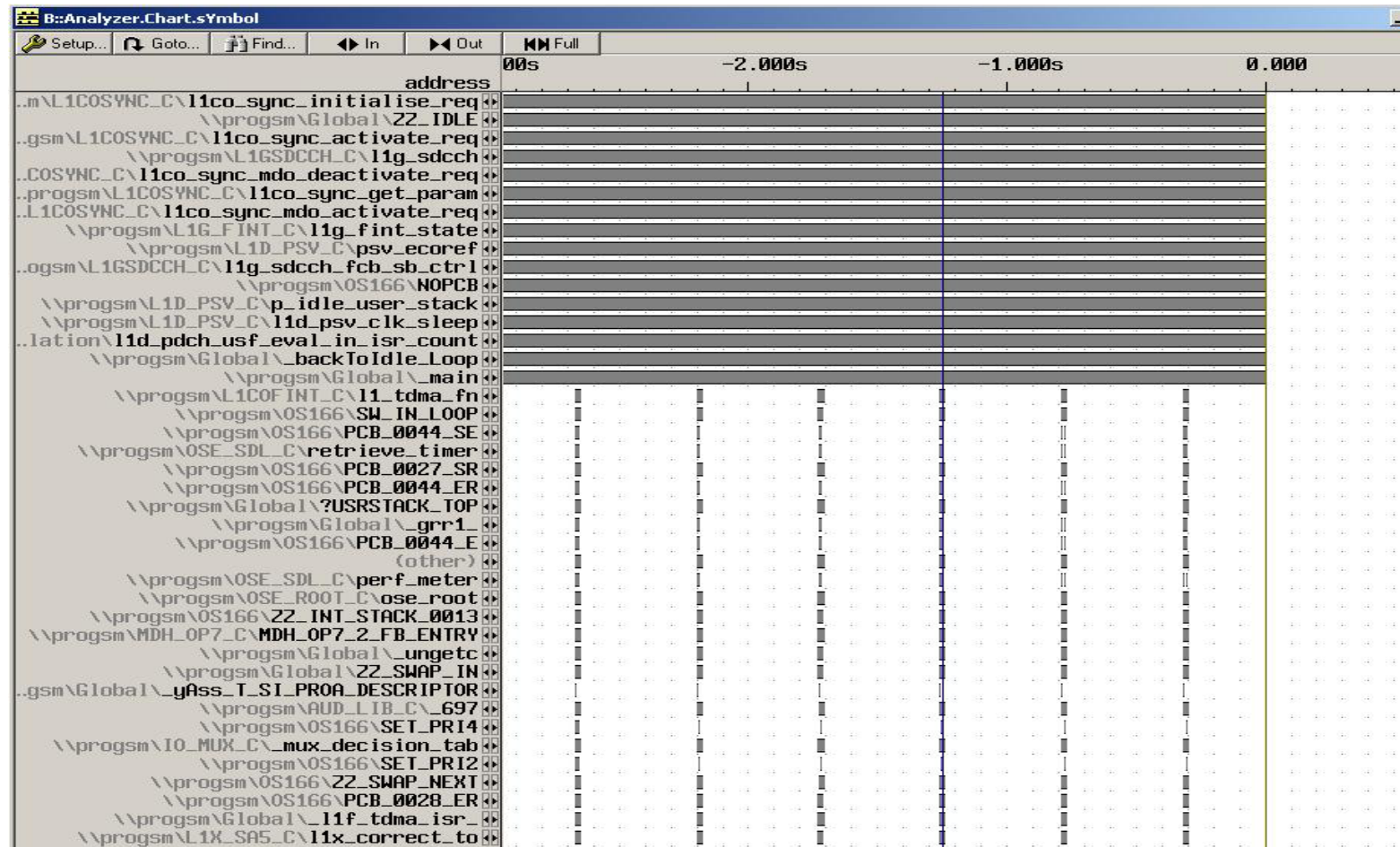
HEX format

Store only address d.w  
and symbol



## Method Analyzer: Chart (1)

The result of a task or function analysis can be displayed in graphical form by the chart commands





## Method Analyzer: Chart (2)

---

### ■ Sort

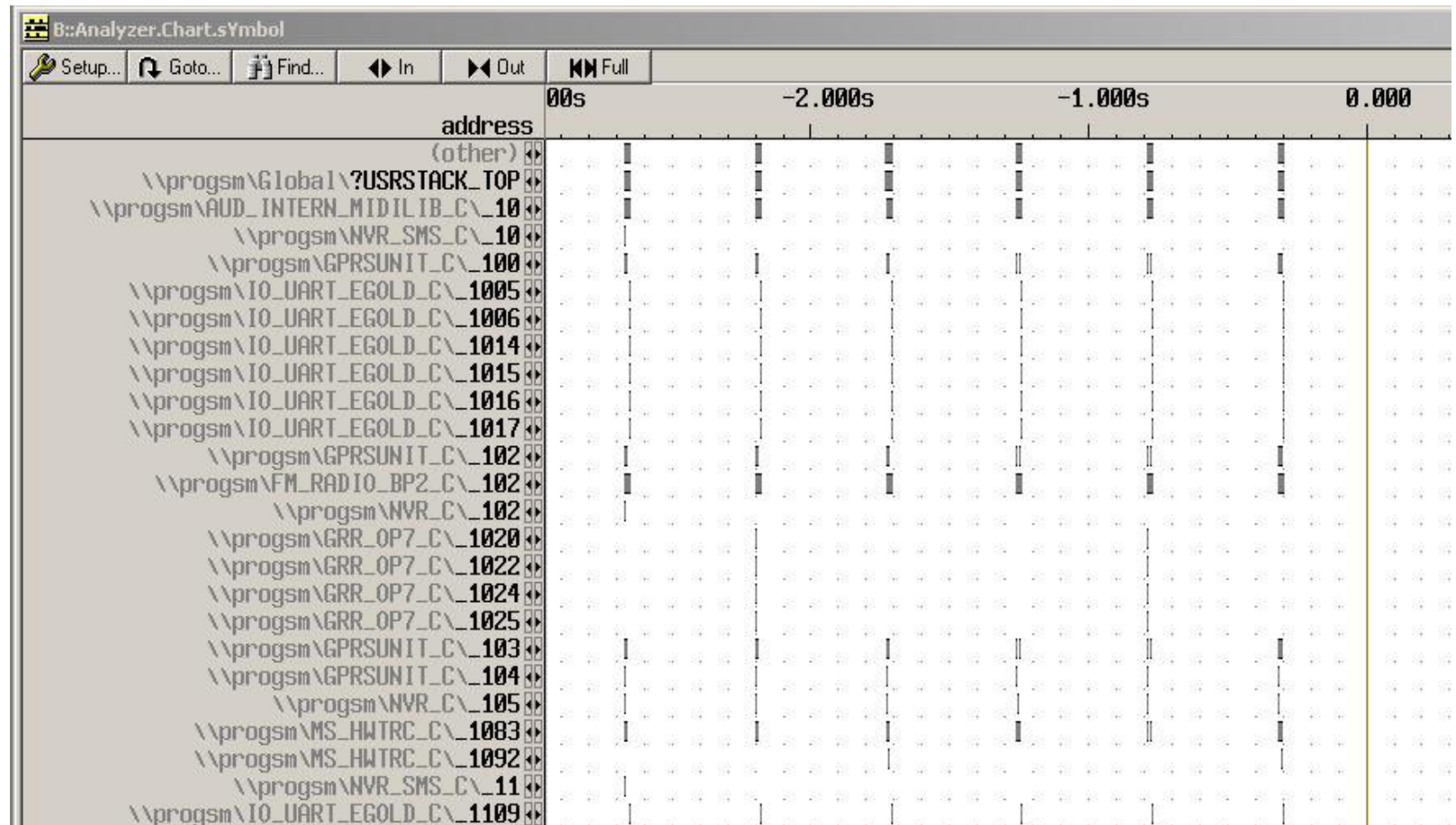
- Use command: `Analyzer.STATISTIC.SORT [<mode>]`  
<mode>: OFF | Ratio | Address | sYmbol | Count

This command selects the display mode for the commands <trace>.Chart.

If OFF mode is selected, the entries will be displayed in the order as they are encountered in the trace memory (this is the default).

## Method Analyzer: Chart (2)

- E.g: Sort by sYmbol -> [Analyzer.STATISTIC.SORT SYMBOL](#)



## Method Analyzer: CTS (1)

---

- The Context Tracking System (CTS) can recover the target context (i.e. register and memory contents) at an arbitrary time sampled in the tracebuffer. This allows to "replay" and single step program execution that was sampled before in a real-time run.
- All basic debugging commands, e.g. Single Step or Step-Over-Call can be executed in this history and variables be monitored in the same way like a "regular" debugging session.

**NEON SEVEN**

**B::Analyzer.Chart.symbal**

Setup... Goto... Find... In Out Full

address 1.135s -1.135s -1.135s -1.135s -1.135s -1.135s

\\progs\global\22\_IDLE  
..gsm\L1COSYNC\_C\l1co\_sync\_activate\_req  
..gsm\L1GSDCCH\_C\l1g\_sdcch  
..COSYNC\_C\l1co\_sync\_mdo\_deactivate\_req  
..progs\L1COSYNC\_C\l1co\_sync\_get\_param  
..L1COSYNC\_C\l1co\_sync\_mdo\_activate\_req  
..progs\L1G\_FINT\_C\l1g\_fint\_state  
..progs\L1D\_PSV\_C\psv\_ecoref  
..ogsm\L1GSDCCH\_C\l1g\_sdcch\_fcb\_sb\_ctrl  
..progs\OS166\_NOPCB  
..progs\L1D\_PSV\_C\p\_idle\_user\_stack

Analyzer  
Zoom Window  
R> Set Ref  
Z> Set Zero  
**S> Set CTS**  
View  
List  
Timing

[B::Data.List]  
Step Over Next Return Up Back Off

addr/line code label mnemonic comment

```

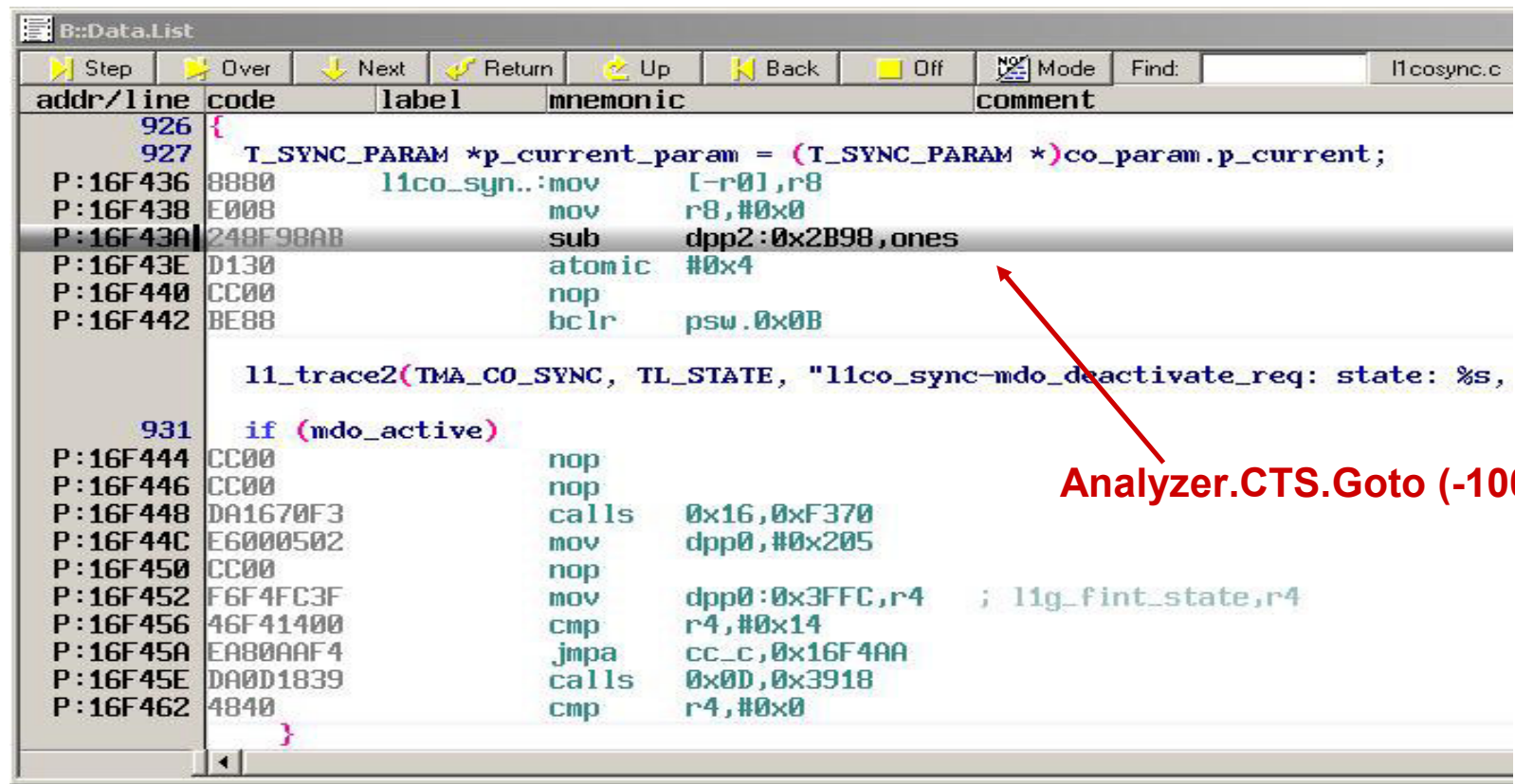
/*
GLOBAL void l1co_sync_activate_req (void)
{
    P:16F4DE 3D18      l1co_syn.: jmp r8, cc_ne, 0x16F510
    P:16F4E0 DA15D4D4   calls 0x15, 0xD4D4
    P:16F4E4 4980      cmpb r14, #0x0
    P:16F4E6 2D18      jmp r8, cc_eq, 0x16F518
    P:16F4E8 E6000502   mov dpp0, #0x205

    l1_trace1(TMA_CO_SYNC, TL_STATE, "l1co_sync_activate_req: start state: %s\n"
    L1CO_ACTIVATE(SYNC);
    P:16F4EC CC00      nop
    P:16F4EE F2F8FC3F   mov r8, dpp0:0x3FFC ; l1_state, l1g_fint_state
    P:16F4F2 46F8CB01   cmp r8, #0xCB ; l1_state, #459
    P:16F4F6 FD04      jmp r8, cc_ule, 0x16F500
    P:16F4F8 E6FCCB01   mov r12, #0x1CB
    P:16F4FC F6FCFC3F   mov dpp0:0x3FFC, r12 ; l1g_fint_state, r12
    P:16F500 E6000502   mov dpp0, #0x205
    P:16F504 CC00      nop
    P:16F506 F2FCFC3F   mov r12, dpp0:0x3FFC ; r12, l1g_fint_state
    P:16F50A DA17C039   calls 0x17, 0x39C0
    P:16F50E 0D04      jmp r8, cc_nc, 0x16F518
    P:16F510 4880      cmp r8, #0x0 ; l1_state, #0
    P:16F512 2D02      jmp r8, cc_eq, 0x16F518
    P:16F514 DA10DAFF   calls 0x10, 0xFFDA ; ITX_OP_IR_FB_ENTRY
    P:16F518 D130      atomic #0x4
    P:16F51A CC00      nop
    P:16F51C BE88      bset nsw, 0x0B

```

## Method Analyzer: CTS (3)

- Views the context at the given record
  - Command `Analyzer.CTS.Goto [<record>]`



The screenshot shows the Method Analyzer CTS window with the following assembly code:

addr/line	code	label	mnemonic	comment
926	{			
927	T_SYNC_PARAM *p_current_param = (T_SYNC_PARAM *)co_param.p_current;			
P:16F436	8880	l1co_syn..	mov	[-r0],r8
P:16F438	E008		mov	r8,#0x0
P:16F43A	248F98AB		sub	dpp2:0x2B98,ones
P:16F43E	D130		atomic	#0x4
P:16F440	CC00		nop	
P:16F442	BE88		bclr	psw.0x0B
				l1_trace2(TMA_CO_SYNC, TL_STATE, "l1co_sync-mdo_deactivate_req: state: %s,
931	if (mdo_active)			
P:16F444	CC00		nop	
P:16F446	CC00		nop	
P:16F448	DA1670F3		calls	0x16,0xF370
P:16F44C	E6000502		mov	dpp0,#0x205
P:16F450	CC00		nop	
P:16F452	F6F4FC3F		mov	dpp0:0x3FFC,r4 ; l1g_fint_state,r4
P:16F456	46F41400		cmp	r4,#0x14
P:16F45A	EA80AAF4		jmpa	cc_c,0x16F4AA
P:16F45E	DA0D1839		calls	0x0D,0x3918
P:16F462	4840		cmp	r4,#0x0
	}			

Analyzer.CTS.Goto (-1000.)



## Method Analyzer: Remote debug (1)

---

- To perform a remote debug all memory status, CPU register and history buffer shall be stored on file.
  - Save External RAM contents
    - Data.SAVE.Binary c:\userdata\photo\_of\_ram.bin 0x0800000--0x0bffffe /word
  - Save of PRAM
    - Data.SAVE.Binary c:\userdata\photo\_of\_pram.bin 0x018000--0x01ffffe /word
  - Save SFR-ESFR-CPU Regs
    - Data.SAVE.Binary c:\userdata\photo\_of\_dram.bin 0x0d000--0x0ffffe /word
  - Save history buffer
    - Winprint.Analyzer.List (startindex)--(endindex) [param]

## Method Analyzer: Remote debug (2)

---

- All stored files must be reloaded into the local Trace Analyzer to perform the remote debug
  - The steps are:
    1. Load Cmm configuration file
    2. Load External RAM contents
      - `Data.load.Binary c:\userdata\photo_of_ram.bin 0x0800000--0x0bffffe /word`
    3. Load of PRAM
      - `Data.load.Binary c:\userdata\photo_of_pram.bin 0x018000--0x01ffffe /word`
    4. Load SFR-ESFR-CPU Regs
      - `Data.load.Binary c:\userdata\photo_of_dram.bin 0x0d000--0x0ffffe /word`
    5. Load abs file
      - `d.load.i absfile.abs /nocode`

## Method Analyzer: External trigger (1)

---

- An External trigger can be used to stop the Analyzer trace when the external event is reached
- Steps
  - Connect an external trigger to the **TRIGGER** connector of Lauterbach
  - Select **Trigger BUS** from Break Menu
  - Set **Connect In** for external input
  - Set Mode, it depends on type of external trigger
  - Set **ATrigger**
  - Arm the analyzer
  - When the external trigger is reached the analyzer is stopped. Push on list button to open the history buffer and to see the list of functions that are running when the trigger occur.



## Method Analyzer: External trigger (2)

**B::TrBus**

control  
☐ OFF  
☒ Arm

level  
high

monitor  
☐ Trigger

Connect  
☐ Out  
☒ In

Mode  
☐ Low  
☐ High  
☒ Falling  
☐ Rising

Set (from BUS)  
☐ Break  
☐ ABreak  
☒ ATrigger

Out (to BUS)  
☐ Break  
☐ ABreak  
☐ ATrigger

**B::Trace**

METHOD  
☒ Analyzer  
☐ Logger  
☐ SNOOPer  
☐ One

state  
☐ DISable  
☐ OFF  
☐ Arm  
☐ trigger  
☒ break

used  
11990216.

SIZE  
16777216.

TDelay  
0.  
0%

ACCESS  
[Dropdown]

Mode  
☒ Fifo  
☐ Stack  
☐ Leach  
☒ BusTrace  
☐ ClockTrace  
☐ FlowTrace  
☐ Poststore  
☐ PostTrace  
☒ SLAVE

Threshold  
☒ VCC  
☐ CLOCK  
0.94

probe  
☒ TERMination

commands  
RESet  
Init  
TEST  
List  
☒ AutoArm  
☐ AutoInit  
☐ AutoTEST

External trigger is reached and the analyzer is stopped

## Method Snooper

---

- The intention of the SNOOPer trace is to sample data information over the time
- The user define a sampling rate and the TRACE32 software reads out the requested information in this sampling rate while the CPU is executing the program and transfers the information to the SNOOPer trace
- Max. trace size: Up to 1 M frames
- Fastest sampling rate: 20 -100 us

## Method Snooper: Example

Sample of the I1\_tdma\_fn variable: Rate 1ms, buffer size 4096.

The screenshot shows the 'B::Trace' window with the 'METHOD' tab selected. The 'SNOOPer' radio button is chosen. The 'state' section has 'OFF' selected. The 'used' section shows a blue bar and the value '4096.'. The 'SIZE' section has '4096.' entered. The 'SElect' section has '%L I1\_tdma\_fn' entered. The 'TValue' section is empty. The 'Rate' section has '1.000ms' and '1000.' entered, with a 'max' of '1.036ms'. The 'Mode' section has 'Fifo' selected, and 'Memory' is also selected. The 'TMode' section has 'Trace' selected. The 'TDelay' section has '0.' entered. The 'commands' section has 'RESet', 'Init' (selected), 'TEST', and 'List' buttons. The 'AutoArm' checkbox is checked, while 'AutoInit' and 'AutoTEST' are unchecked.

**B::Trace**

**METHOD**

☐ Analyzer ☐ Logger ☒ SNOOPer ☐ Onchip ☐ Integrator ☐ Probe

**state**

☐ DISable ☒ OFF ☐ Arm ☐ trigger ☐ break

**used**

4096.

**SIZE**

4096.

**SElect**

%L I1\_tdma\_fn

**TValue**

**Rate**

1.000ms

1000.

**max**

1.036ms

**Mode**

☒ Fifo ☐ Stack ☒ Memory ☐ DCC ☐ Changes ☒ SLAVE

**TMode**

☒ Trace ☐ Program ☐ PULSE ☐ BUSA

**TDelay**

0.

**commands**

RESet

☒ Init

TEST

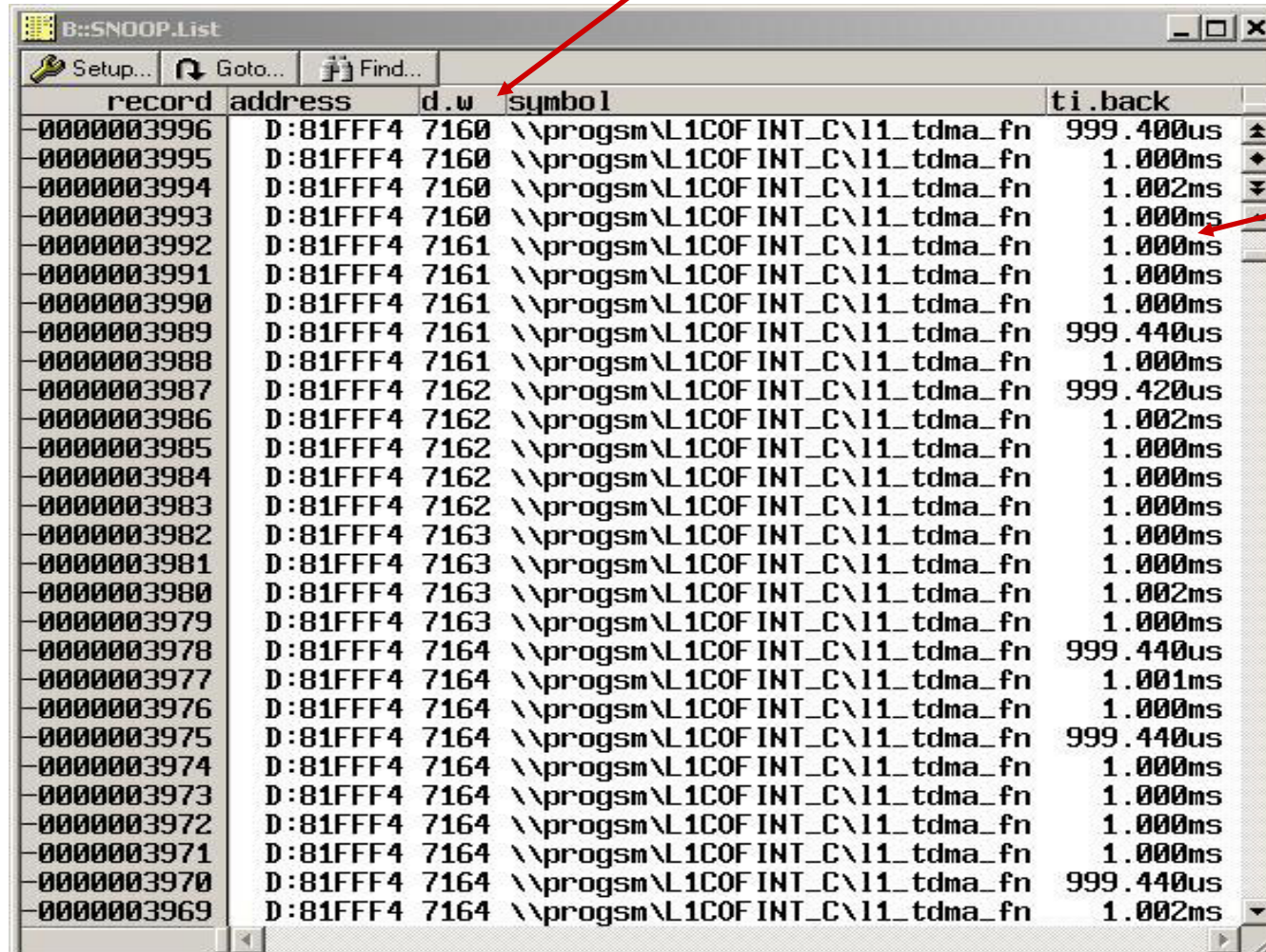
List

☒ AutoArm ☐ AutoInit ☐ AutoTEST

## Method Snooper: Example

Result of Snooper buffer

Value of l1d\_tdma\_fn



record	address	d.w	symbol	ti.back
0000003996	D:81FFF4	7160	\\progsml1COF INT_C\11_tdma_fn	999.400us
0000003995	D:81FFF4	7160	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003994	D:81FFF4	7160	\\progsml1COF INT_C\11_tdma_fn	1.002ms
0000003993	D:81FFF4	7160	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003992	D:81FFF4	7161	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003991	D:81FFF4	7161	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003990	D:81FFF4	7161	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003989	D:81FFF4	7161	\\progsml1COF INT_C\11_tdma_fn	999.440us
0000003988	D:81FFF4	7161	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003987	D:81FFF4	7162	\\progsml1COF INT_C\11_tdma_fn	999.420us
0000003986	D:81FFF4	7162	\\progsml1COF INT_C\11_tdma_fn	1.002ms
0000003985	D:81FFF4	7162	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003984	D:81FFF4	7162	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003983	D:81FFF4	7162	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003982	D:81FFF4	7163	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003981	D:81FFF4	7163	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003980	D:81FFF4	7163	\\progsml1COF INT_C\11_tdma_fn	1.002ms
0000003979	D:81FFF4	7163	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003978	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	999.440us
0000003977	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	1.001ms
0000003976	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003975	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	999.440us
0000003974	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003973	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003972	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003971	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	1.000ms
0000003970	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	999.440us
0000003969	D:81FFF4	7164	\\progsml1COF INT_C\11_tdma_fn	1.002ms

Rate 1ms

## Power Trace debug using two boards

---

- Connection of the Power Trace to the DUT and the JTAG to another board

- Main reasons

1. Trap “Non-treatable” exceptions
2. Trace DUT in power saving



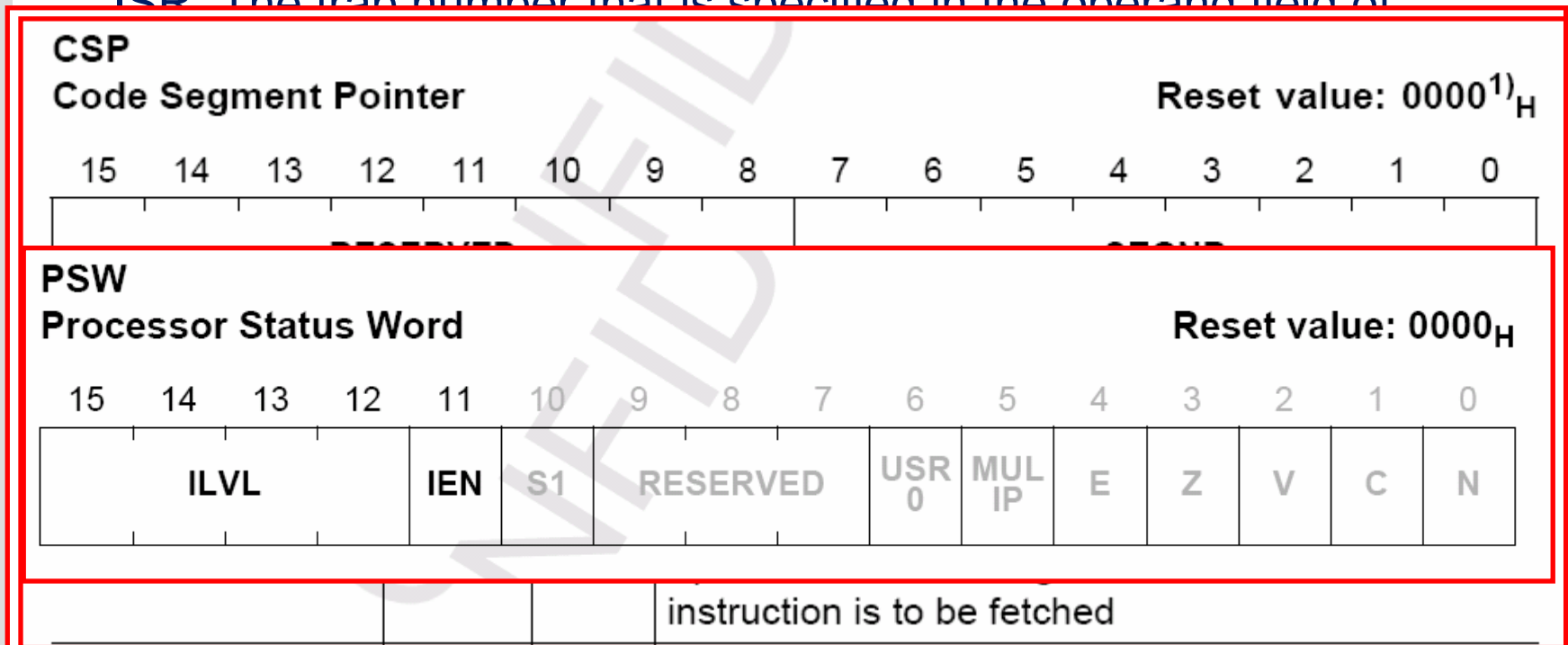
## "Treatable" exceptions

---

- To investigate the occurrence of a crash, an appropriate set of breakpoints shall be selected and used with the real-time debugger tool (Lauterbach).
- Once the system has halted, the tool will make some useful information available to the developer, i.e:
  - After an exception, **PSW**, **CSP** (in segmentation mode), and **IP** have been pushed into the system stack. PSW, Stack Pointer and Registers are accessible via CPU→CPU Registers
  - All chipset registers, available via menu/view/peripherals once the file <chipset>.per is made visible.
  - In case the .cmm file does not provide it by default, the system stack can be inspected by entering the following command:
    - `d.v %SYMBOL.LONG register(sp) /TRACK`

## Software traps

- The TRAP instruction is used to cause a software call to an ISR. The trap number that is specified in the operand field of

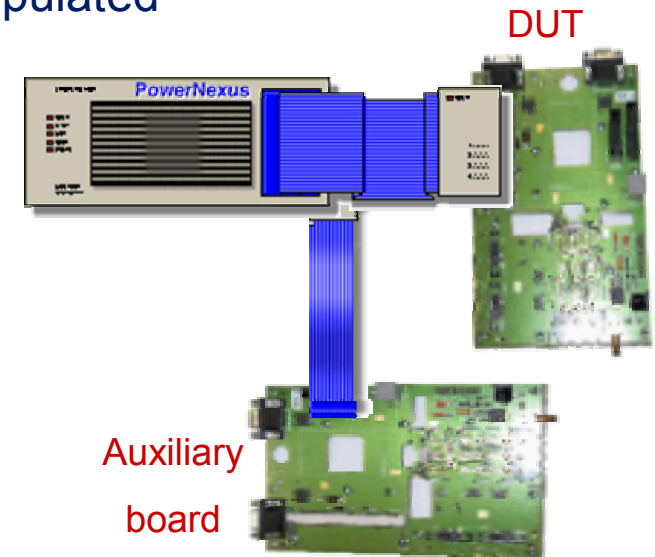


- **TFR** |= TRAP\_NMI; /\* Invoke the Non Maskable Interrupt Trap flag \*/
- }
- This function is called by ms\_exit and ose\_exception\_handler.

## Non-treatable exceptions: Connection lost

- When no BP is available for debugging, the DUT goes to “connection loss” state. In this case you have two options
  - Select “CPU→System Settings→No debug” and then “Trace→List→All” backtrace will be populated
  - Connect the Power Trace to the DUT and the JTAG to another board.

When the DUT crashes, stop the auxiliary board and look to the backtrace. Please make sure you are using the .abs file of the version loaded on the DUT.





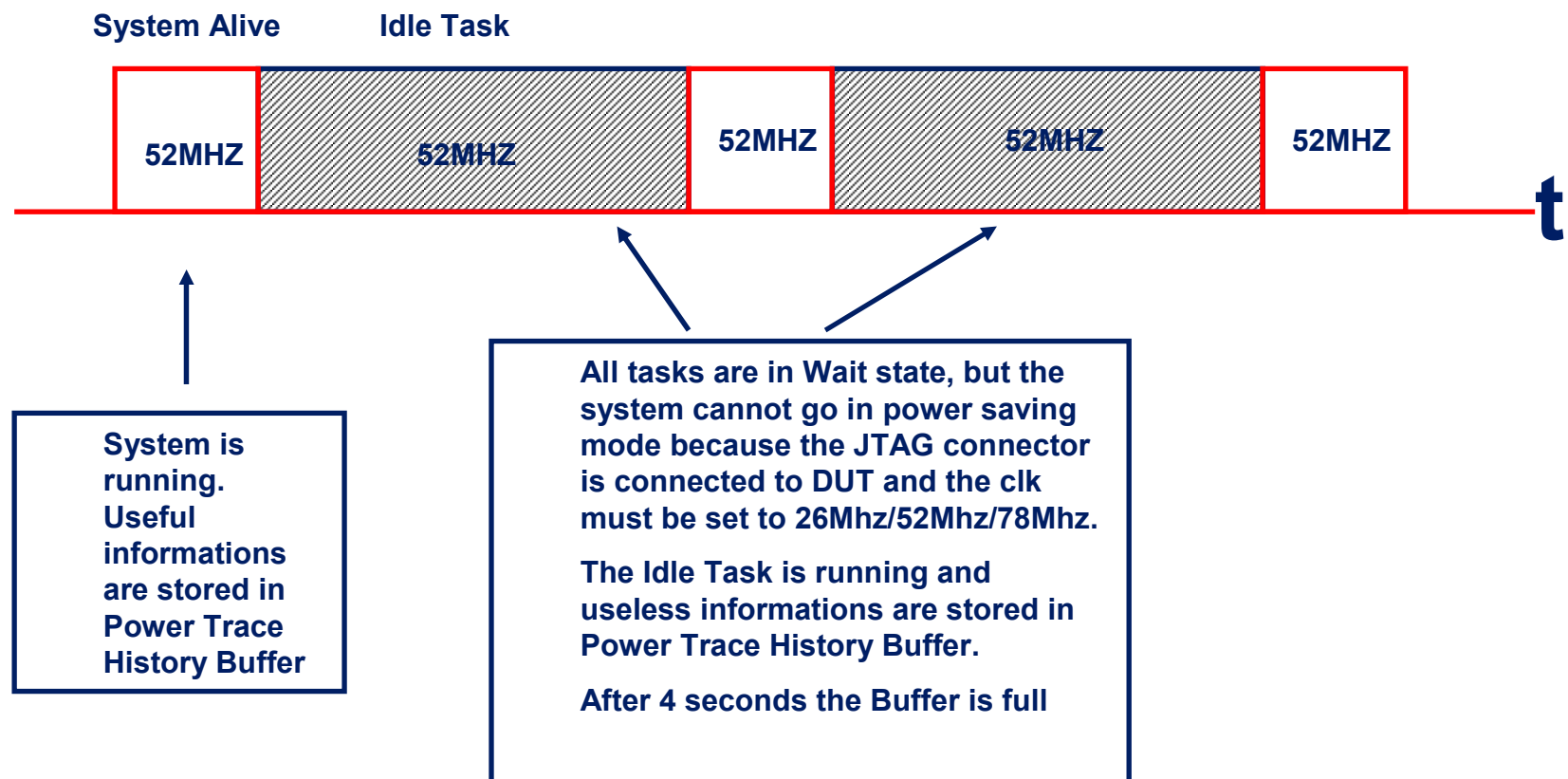
## Trace DUT in power saving

---

- When JTAG Connector and Power Trace connected on same DUT:
  - When all tasks are in Wait state, the system cannot go in power saving mode because the JTAG connector is connected to DUT and the master clock must be set to 26Mhz/52Mhz/78Mhz otherwise the JTAC loss the connection to the DUT.
  - When all task are in wait state only the Idle Task is running and useless informations are stored in Power Trace History Buffer  
→ There are a lot of call to Idle Task in the History
  - After 4 seconds the Buffer is complete full.
  - Is not possible to analyze the real behavior because DUT never go in power saving mode.

## Trace DUT in power saving

- JTAG Connector and Power Trace connected on same DUT:

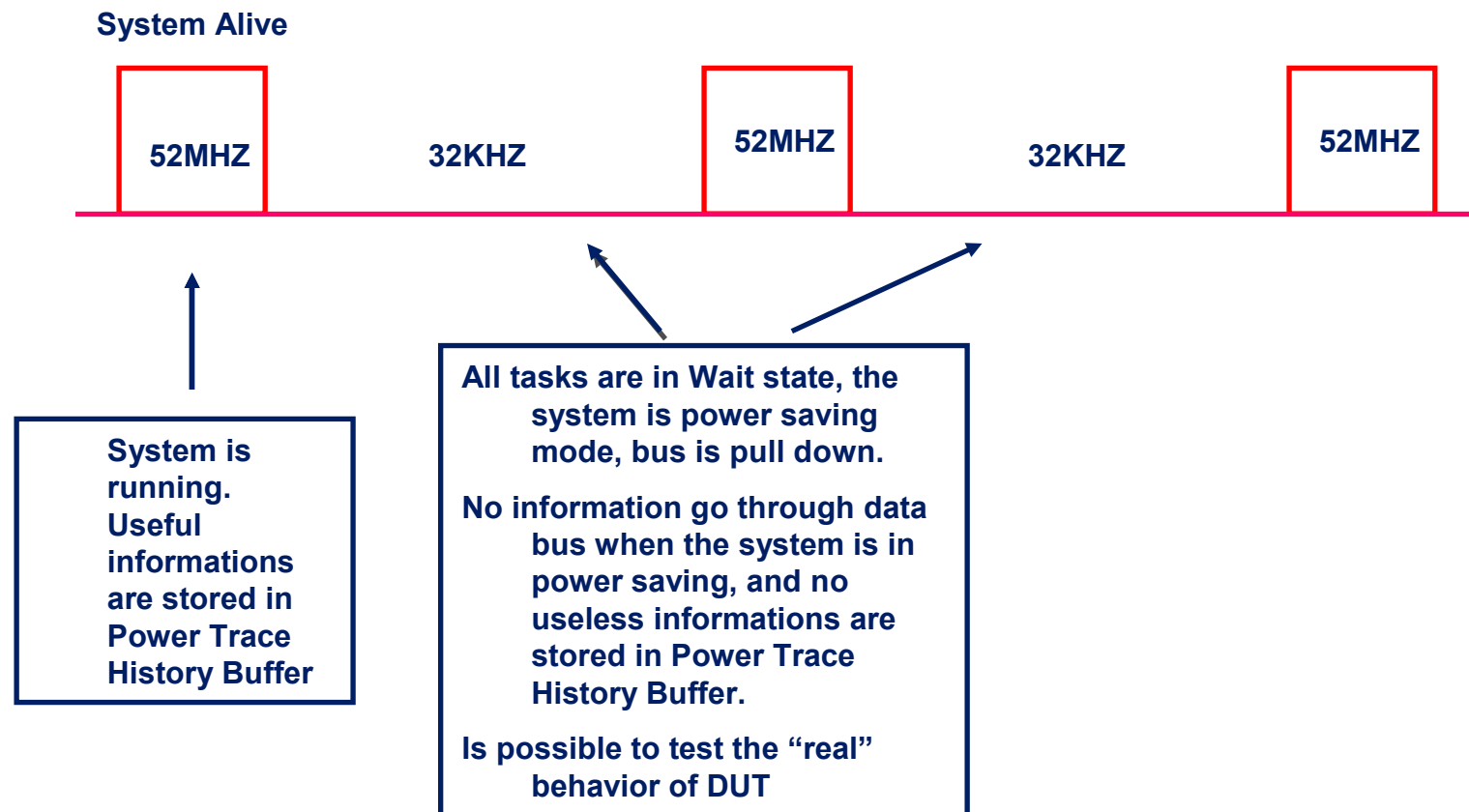


## Trace DUT in power saving

---

- By Connecting the Power Trace to the DUT and the JTAG to another board
  - Is useful to trace DUT in power saving mode, because it prevents the JTAG connector from keeping the MS awaken and lengthens the temporal duration of the backtrace.
  - Only the useful information are stored in the History buffer. When the system is alive the data are stored, when the system go in power saving mode the bus is put in pull down, no task is running, no data through to the bus → no useless data stored.
  - Is possible to analyze about 1 minute of real life of DUT (the maximum time stored depend on of the status of DUT, and on the activities performed)

## Trace DUT in power saving

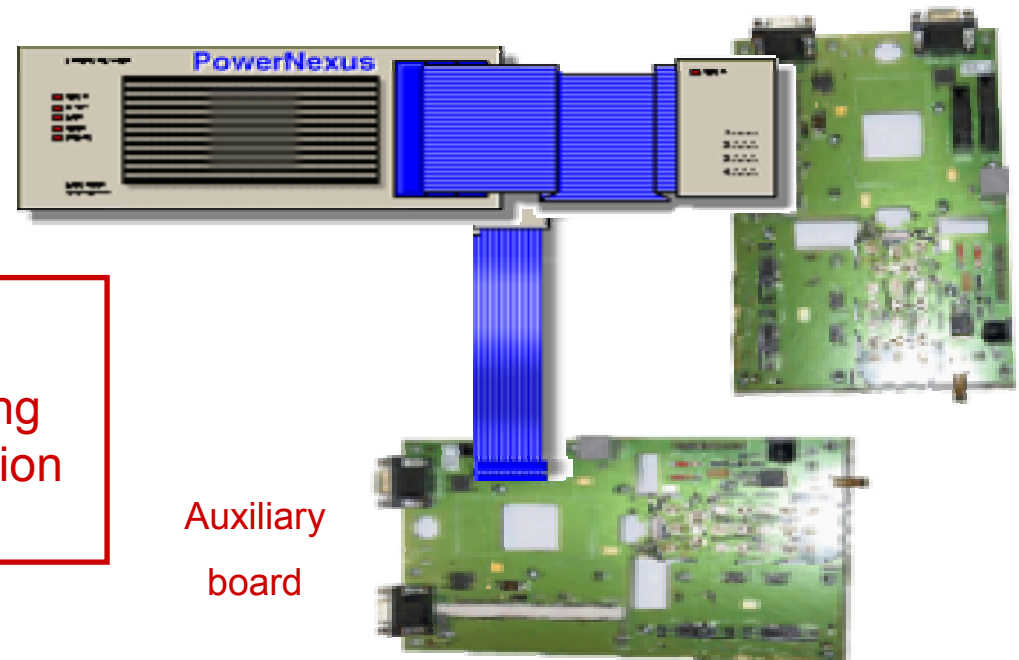


## Trace DUT in power saving

### ■ Example of connections

DUT that can enter in  
power saving mode

DUT



**IMPORTANT!!**

Make sure you are using  
the .abs file of the version  
loaded on the DUT

Auxiliary  
board