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System Trace™

Time Correlated Scalable Monitoring

User Manual

Includes:

General Overview, Specifications, Installation, and Module Specific Information for the VME Backplane and MIL-STD-1553 Monitor Modules

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SystemTrace™

Product Philosophy

by ITCN

SystemTrace™ provides a means to monitor the activities of products that incorporate embedded processors. The activities of these systems can be defined by the user as events. The events may be a range or single item occurring in a system that requires investigation. SystemTrace™ can be setup to react to the event based on how often the event occurs, what events have already occurred, or time elapsed from another event. The reaction may be, recording the event and/or outputting signals that interact internally and/or externally to SystemTrace. Data from the events may be recorded using a high speed, short-term mode or a long-term, logging to disk mode, a run time data viewing and statistics modes are also available. All data collected from the various entities on a target system instrumented with SystemTrace™ are time stamped and can be time correlated. The required user inputs to control the behavior discussed above may be done from any workstation running the ITCN SystemTrace™ software and connected to an Ethernet LAN.

The SystemTrace™ UIP uses a Graphical User Interface format with windows, sub-windows, menus, and dialog boxes familiar to Windows users. The UIP provides a Post Run Analysis program that presents recorded event data in a line-by-line record format. The data presentation may be filtered to present only specific categories of data defined by the user. Data may also be presented in time charts and graphs.

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SystemTrace ™ User Guide

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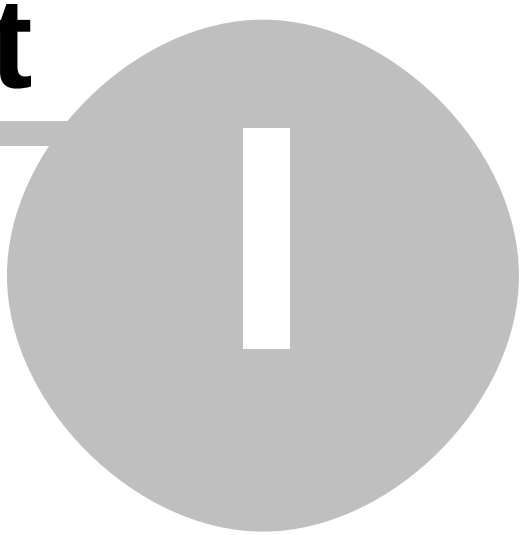
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Part



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1 Product Overview

SystemTrace™ provides a means to monitor the activities of products that incorporate embedded processors. The activities of these systems can be defined by the user as events. The events may be a range or single item occurring in a system that requires investigation. SystemTrace™ can be setup to react to the event based on how often the event occurs, what events have already occurred, or time elapsed from another event. The reaction may be, recording the event and/or outputting signals that interact internally and/or externally to SystemTrace. Data from the events may be recorded using a high speed, short-term mode or a long-term, logging to disk mode, a run time data viewing and statistics modes are also available. All data collected from the various entities on a target system instrumented with SystemTrace™ are time stamped and can be time correlated.

The required user inputs to control the behavior discussed above may be done from any workstation running the ITCN SystemTrace™ software and connected to an Ethernet LAN. The SystemTrace™ UIP uses a Graphical User Interface format with windows, sub-windows, menus, and dialog boxes familiar to Windows users. The UIP provides a Post Run Analysis program that presents recorded event data in a line-by-line record format. The data presentation may be filtered to present only specific categories of data defined by the user. Data may also be presented in time charts and graphs.

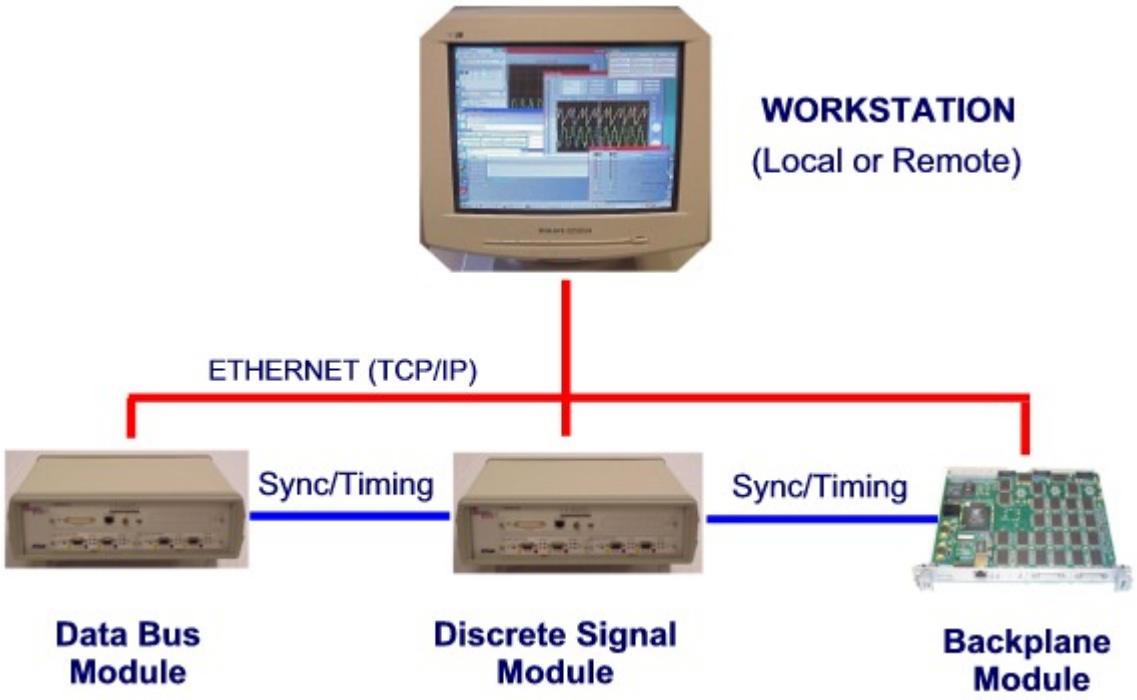
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1.1 System Description

The basic SystemTrace™ Instrumentation Network is shown in the figure *SystemTrace™ Instrumentation Network*. It is a modular, distributed, embedded instrumentation system used to develop, analyze, and maintain products that incorporate embedded microprocessors, microcontrollers, and data busses. The instrumentation system consists of one or more workstations, a communication network, and one or more Modules with target specific Probes within. The SystemTrace™ architecture provides the capability to monitor the activity of multiple electronic target assemblies using a single focal point. Controlled by a user-generated specification, the SystemTrace™ Modules collect data from the target assemblies. System data collection is synchronized across the Modules. The collected data is time correlated and available to the operator for detailed analysis.

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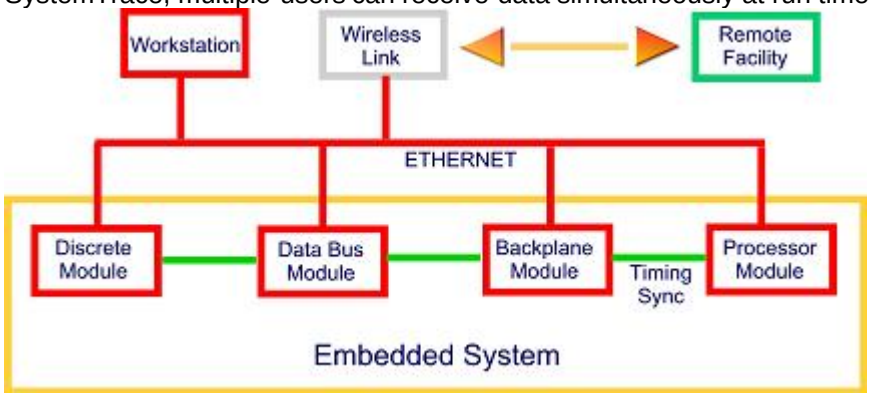
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SystemTrace™ Instrumentation Network

1.1.1 Network Centric

The user interface connection for the SystemTrace™ Module is ETHERNET (TCP/IP). The Modules are network resources and can be allocated to any user with access to the network. This also means that the Modules could be accessed via the INTERNET. Using the data subscription utility of the SystemTrace, multiple users can receive data simultaneously at run time from the desired targets.



SystemTrace™ Network

1.1.2 Symbolic Operations

The SystemTrace™ offers symbolic operations for data monitoring set up. This provides the user a means of attaching a symbolic name to memory locations of interest and using the symbols in setup and data analysis. The SystemTrace™ adds to this some generic symbol translators that allow the user to import tables of symbols. This provides the ability to relate to data on the instrumented backplane, databus, processor, or discrete signal in terms familiar to the user, rather than hexadecimal addresses and message packets.

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1.1.3 Real-Time Non-Intrusive Monitoring

The RTNI monitoring capability is a unique feature that acquires data selected by the user in a way that doesn't affect the target's functional operation. This feature allows the user to specify run time filters and collect the data of interest for post run analysis. It also provides for selected variables, statistics, and bus data to be viewed in run time. In addition to user selectable data, the SystemTrace™ has a history buffer capable of tracing all data based around a user specified trigger event. The SystemTrace™ provides the ability to perform multiple traces before uploading data, fast data upload times using 100 Mbit/ sec Ethernet, Run-Time data subscription utilities for multiple users, and robust data analysis for both run time and post run.

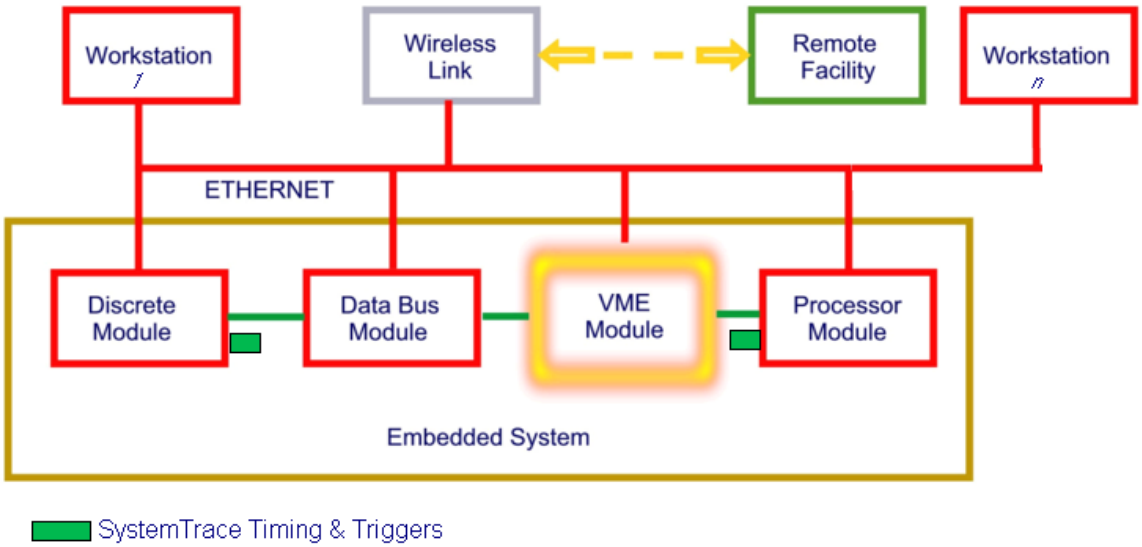
1.1.4 Time Reference

For systems that contain more than one Module, the Time Synchronization signal provides synchronization across Modules without user intervention. This grouping of Modules on a common sync signal is referred to as a Module Group.

All SystemTrace™ Modules are capable of providing a time sync signal. The one Module that is selected by SystemTrace™ to provide time sync for its group is referred to as the Time Master. The Time Master Module will provide its status to the SystemTrace™ Workstation and be reported in the Session Modules window "Master" column. The Analysis Manager also reports which Module was Time Master in its display along with the recorded date and time. This recording of the time is referred to as Time Tags or Time Stamps. Time can be continuously recorded without a rollover for Monitor sessions lasting up to thirty days. The Time Master is reset when the Monitor session is stopped.

1.2 SystemTrace Architecture

The SystemTrace™ architecture consists workstations, a communication network, and Modules as indicated by the Figure *SystemTrace™ Architecture*.
The Workstation is a PC, running Windows NT, 2000, or XP with the SystemTrace™ GUI that provides an interface to setup, control, and retrieve data from the Modules via the "Open Interface." The communication network provides the interface between the SystemTrace™ Modules and their controlling workstation.



SystemTrace™ Architecture

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1.2.1 Module

The Module is the central component of the instrumentation system and multiple Modules can be distributed throughout the product/ system under test. Modules consist of all the functional elements necessary to attach to the target and monitor target activity. When multiple targets are being simultaneously monitored, the Modules allow inter-Module synchronization for precise time correlation of collected data. The SystemTrace™ Modules provide an RTNI monitor for non-intrusive data collection.

Multiple SystemTrace™ Modules can be physically distributed throughout the facility and networked together and controlled from one or multiple user workstations. Backplane Modules are mounted in the backplane enclosure. Serial Bus and discrete signal Modules can be stand-alone boxes or grouped into rack-mounted systems.

Each SystemTrace™ Module contains one or more Probes. Backplane modules will typically contain only one Probe unless otherwise specified. Standalone Modules can contain up to two databus or discrete probes or a single processor probe.

1.2.1.1 Backplane Modules

SystemTrace™ Backplane Modules are built using the Probe card as the foundation. The EPC and RTT circuit cards are mounted as mezzanine boards on the Probe board. The Log Drive and communications/ TSL connections are also located on the Probe. See the figure *SystemTrace™ VME Module* for an example of the VME Backplane Module.



SystemTrace™ VME Module

1.2.1.2 Stand Alone Modules

SystemTrace™ Stand Alone Modules are packaged in their own chassis as depicted in the figure *SystemTrace Stand Alone Module* . These Modules provide interfaces to targets without available mounting locations, such as MIL-STD-1553 and ARINC-429 serial busses, discrete digital and analog signals, and embedded processor interfaces. Typically, the main chassis can has two Probe slots that can be populated by the user with the compatible Probes of choice.

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SystemTrace™ Stand Alone Module

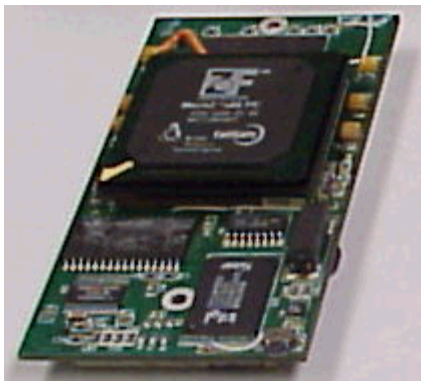
The core architecture of the Stand Alone Module is the same as the Backplane Module, however, configurations will vary. Consult the Probe specific portion of the user documentation for specific architecture descriptions for your Probe and Module.

1.2.1.3 Module Components

SystemTrace™ Module components are the Probe Card, Embedded Processor Card, Real-Time Trace™ Card. Each Target interface type will use the same or similar technology for the Real-Time Trace™ and Embedded Processor Card. Target specific Probe cards are required for interfacing to the different supported target types. In some configurations, the Module is a stand-alone or rack mountable mini-chassis that may contain up to two probes.

1.2.1.3.1 Embedded Processor Card

The SystemTrace™ Embedded Processor Card (EPC) is the heart of each Module. This assembly runs the embedded software and manages all dead-time and run-time data links. The EPC consists of an x86 system on chip processor, flash memory, solid state disk on chip, RAM memory, and the PCI interface to the other components as depicted in figure *EPC Circuit Board* .



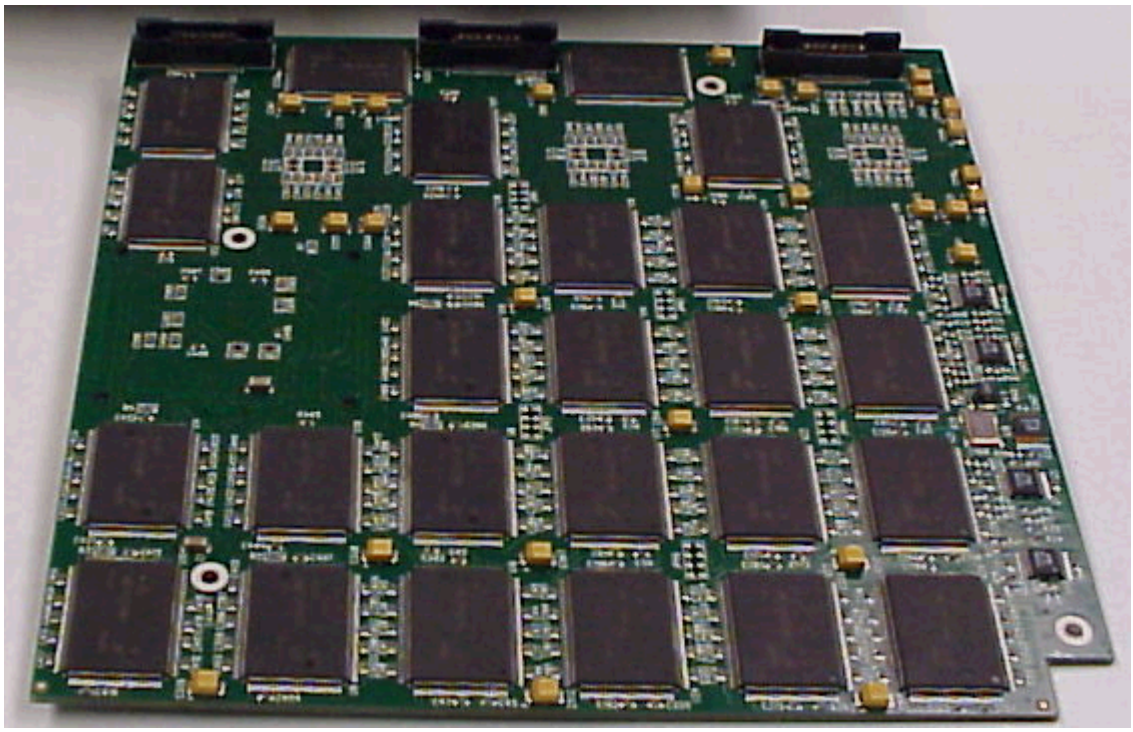
EPC Circuit Board

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1.2.1.3.2 Real-Time Trace Card

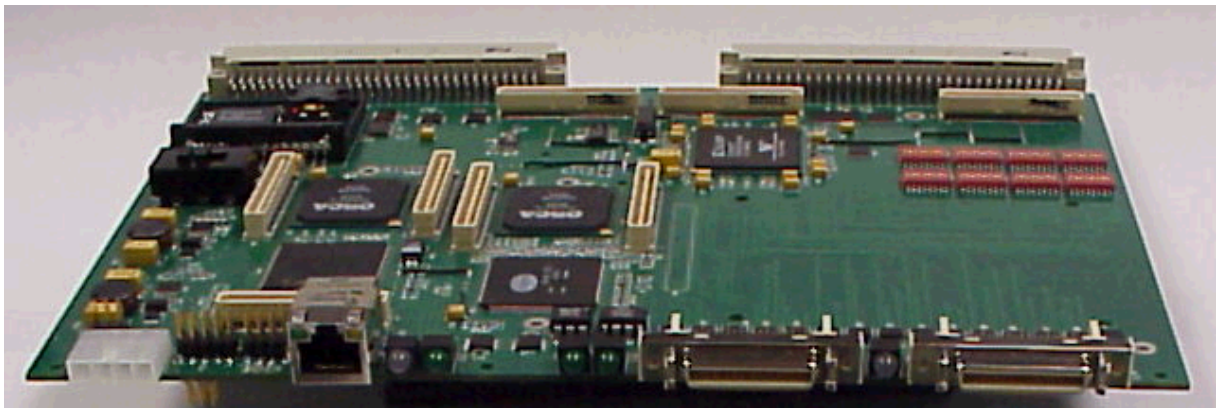
The Real-Time Trace card is the intelligence behind the data capture. This assembly provides run time data filtering, event buffering, and trigger recognition as well as handling the entire event action map settings. An example diagram of the RTT card is shown in figure *RTT Layout.*



RTT Circuit Card

1.2.1.3.3 Probe

The probe assembly is the component of the SystemTrace™ Module that provides the interface to the target under test. This circuit card can be in a variety of formats. For backplane targets, this item is the main carrying unit where the EPC and RTT cards mount. In this case, the form factor is driven by the physical mounting characteristics of the target. For data bus and discrete signal probes, there can be up to two probes in each module. In this case, it is important to remember the difference between Module settings and Probe settings. See the figure *VME Probe Card Layout .*



VME Probe Circuit Card

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1.3 Operational Overview

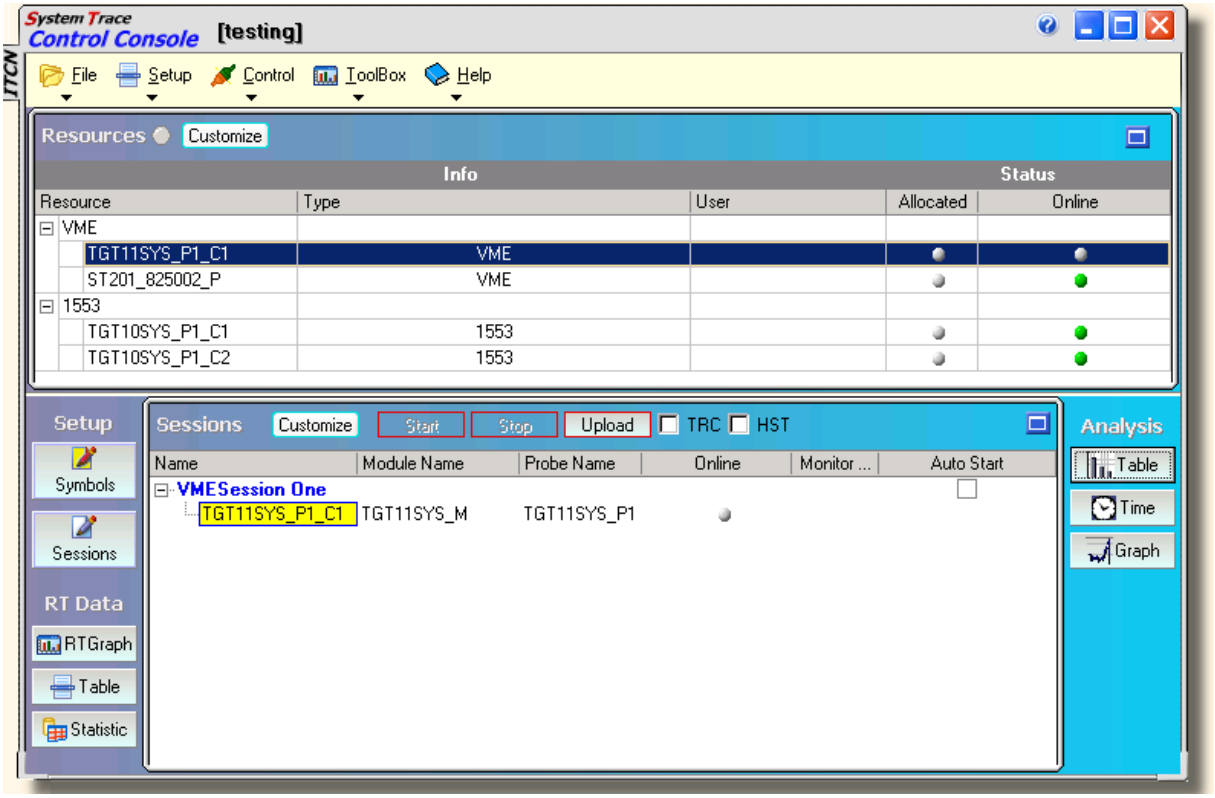
The SystemTrace™ addresses the need for system level instrumentation that can trace "data flow" by monitoring key points throughout the system and time correlating the data for analysis, performance monitoring, diagnostics or prognostics.

The required user inputs to control the behavior of data collection may be performed from any workstation running the ITCN SystemTrace™ software and connected to an Ethernet LAN. The SystemTrace™ UIP uses a Graphical User Interface format with windows, sub-windows, menus, and dialog boxes familiar to Windows users. The UIP provides a Post Run Analysis program that presents recorded event data in a line-by-line record format. The data presentation may be filtered to present only specific categories of data defined by the user. Data may also be presented in time charts and graphs.

1.3.1 User Interface

SystemTrace provides a common user interface intended to collect data that is distributed throughout a system or even data that is geographically dispersed. This Graphical User Interface (GUI) provides control and configuration of the data collection for all distributed modules. The SystemTrace GUI can be installed on multiple workstations. Data from distributed modules may be shared across the instrumentation network. The GUI provides tools for:

- Data monitoring session setup
- Symbol Table setup
- Individual/ Multiple Module control
- Collected data management
- Data analysis for Run-Time data & Statistics and Post-Run data.



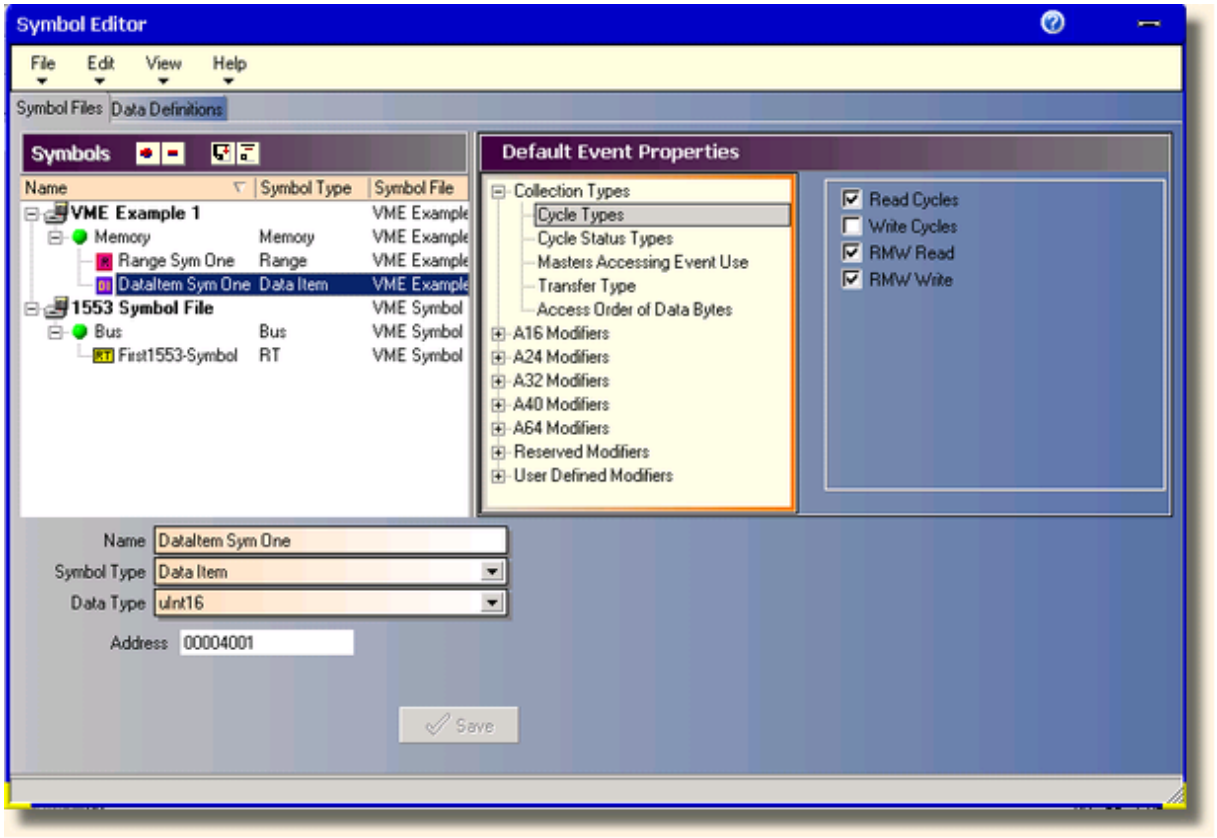
Control Console GUI

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1.3.2 Symbolic Event Definition

The activities of instrumented systems are defined by the user of SystemTrace™ as symbolic events. The events may be a range or single item occurring in a system that requires investigation. The user assembles these data items and into meaningful symbols representing data bus traffic, software execution, backplane transactions, and etc. into a symbol list using the SystemTrace™ Graphical User Interface (See the figure *SystemTrace Symbol Editor Software*.)



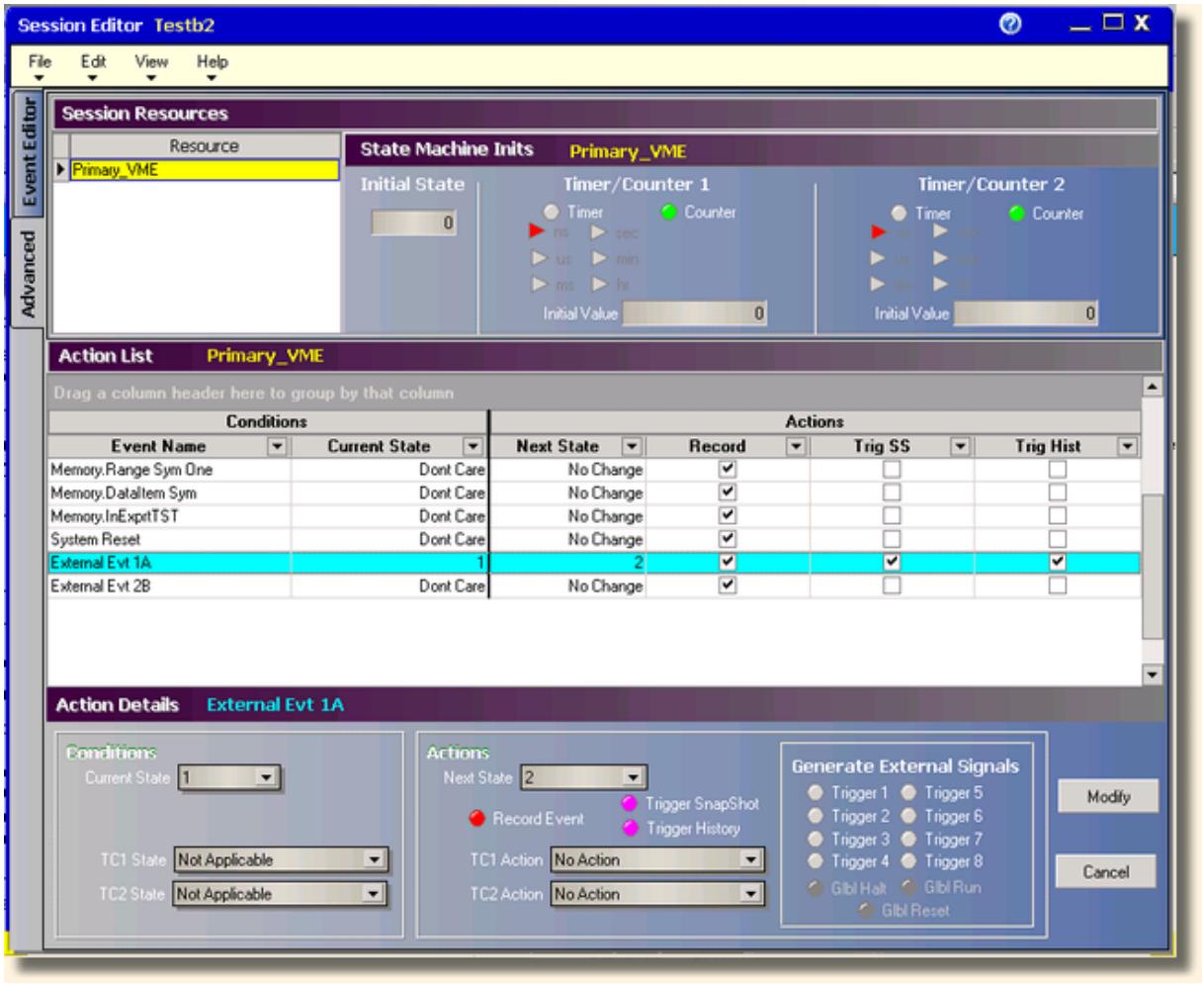
SystemTrace Symbol Editor Software

1.3.3 Event Action Configuration

The SystemTrace™ is then setup to react to the event based on how often the event occurs, what events have already occurred, or time elapsed from another event. The reaction may be to record the event, trigger snapshot buffers, and/or output signals that interact internally/ externally to SystemTrace™. See the figure *SystemTrace Event Editor.*

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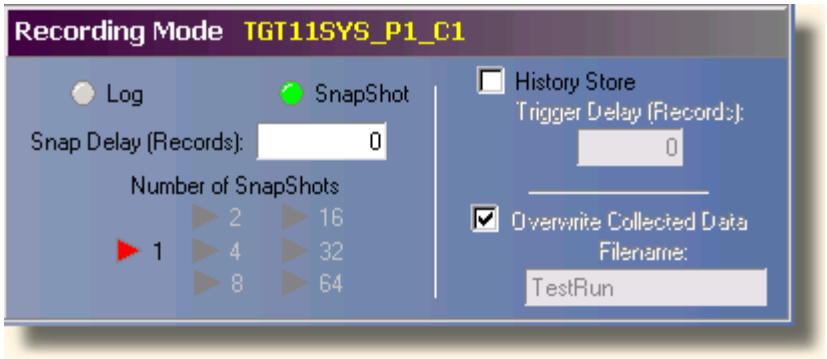
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SystemTrace Event Editor

1.3.4 Modes of Operation

Data from the events are recorded using a high speed, short-term mode or a long-term, logging to disk mode, a run time data viewing and statistics modes are also available. All data collected from the various entities on a target system instrumented with SystemTrace™ are time stamped and can be time correlated. The user would select short-term mode (SNAPSHOT) in order to capture a limited amount of data based around a specified trigger event. Long-term mode would be used to capture a specified amount of data up to ~ 800M records (events). Once the Symbols are generated and the Data Event list is populated, and the mode is selected, the user will then initiate data collection via the user interface.



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Collection Mode Dialog

1.3.5 Run-Time Data

Run-Time data is available while the SystemTrace™ is actively collecting events. The Run-Time data consists of the user defined variables specified for tracing in the Event List. This data is posted on GUI displays and is available while the module is actively collecting data. See the figure *Run-Time Trace Data Display* for an example display.



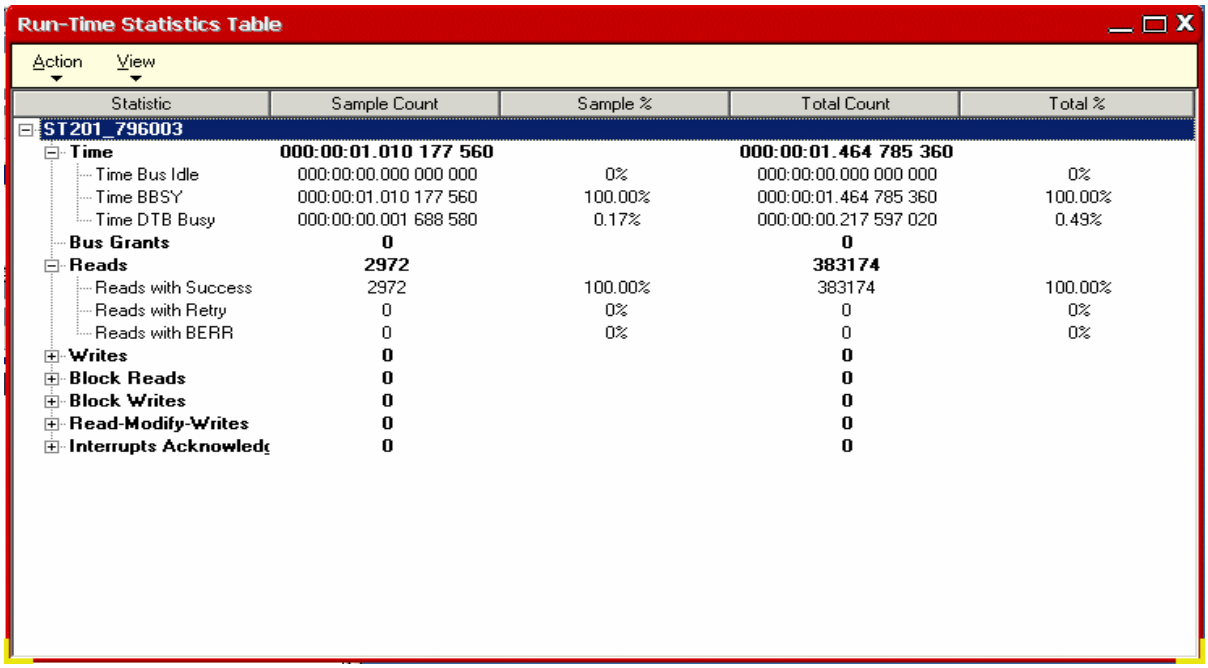
Run-Time Trace Data Display

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1.3.6 Run-Time Statistics

Run-Time Statistics are available from each module connected. This is target specific data that pertains to the performance of the target under test. This data is available while the module is actively collecting data.



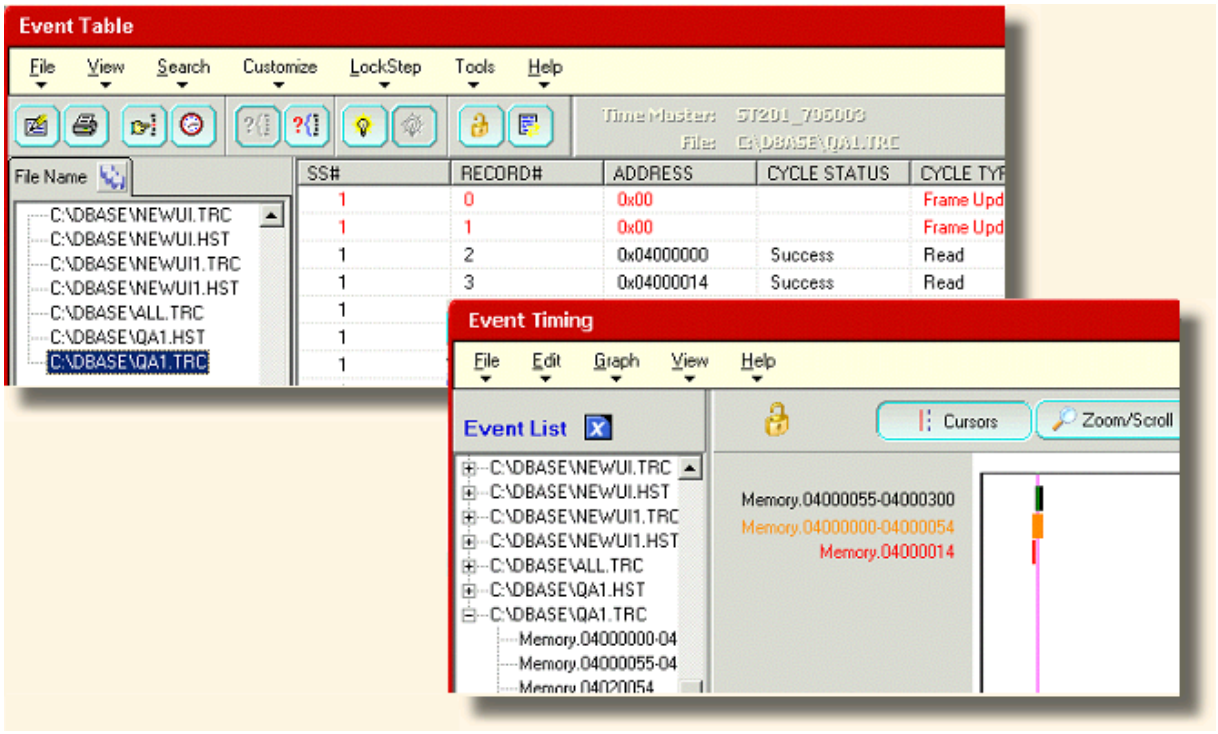
SystemTrace Run Time Statistics

1.3.7 Post Run Data Analysis

The SystemTrace™ GUI provides several types of analysis tools for post run data. Text based table views, timing charts, and data graphs are among those available. In addition, the collected data is available for export in a variety of formats for use in 3rd party applications. See the figure *SystemTrace™ Data Analysis* for examples.

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SystemTrace ™ Data Analysis

1.4 Supportability

SystemTrace™ brings with it a simple architecture with low chance for failure, and a new design that is supportable for years to come. The SystemTrace™ will also have a core architecture that will be common among similar Module types. This means that factory support will be more efficient, which will save time and money for our customers. The programmable logic in SystemTrace™ is designed with re-usability in mind. All target interface and Real-Time Trace logic is designed using VHDL. The embedded software is designed using COTS tools and components that are upgradable into the future.

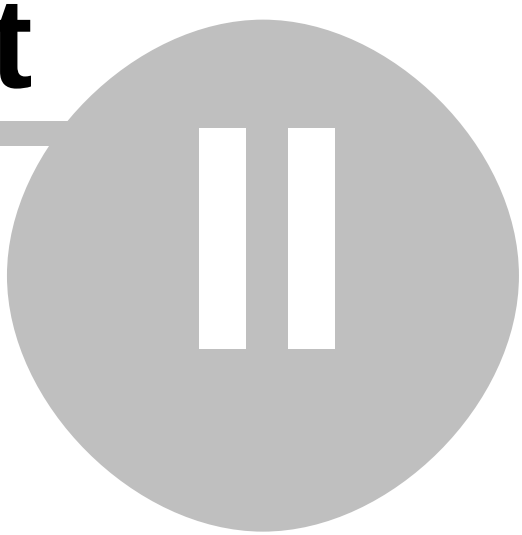
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2 Technichal Specifications

The following topics cover general capabilities and requirements for the SystemTrace product line. Each individual Module will have a section in the documentation that outlines requirements and capabilities.

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2.1 Capabilities

Feature	**Capability**
RTNI Monitoring	Simultaneous monitoring of Multiple Targets, Run-time Data displays, Target statistics
Data Logging	Time-Correlated Data collection, Long-term Data Acquisition & storage (up to 20 GB per Module ~ 800M Events), Programmable data collection scenarios, Multiple scenarios per session, Cross-Module triggering, Complex triggers and filters
Communication Network	Local or Remote setup and control via Ethernet (10/100 Based T) TCP/IP
Other	Modular, Distributed Architecture, Common GUI for all targets, Support for Labviews

2.2 Requirements

The following topics cover a list of requirements for using the SystemTrace tools. Each type of module will have additional requirements called out in Module specific documentation.

2.2.1 Workstation

Minimum Requirements

Component	**Requirement**
Computer / Processor	700 MHz or higher Pentium-compatible CPU.
Memory	256 megabytes (MB) or RAM.
Hard Disk	1.0 GB free space for application and data storage
Operating System	Windows 2000 or NT 4.
Drives	CD-ROM
Network	Ethernet (10/100 Based T) TCP/IP
Other	Keyboard, Microsoft Mouse, or Compatible Pointing Device

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2.2.2 Communication Network

The Communication Network provides bi-directional data transport between the Workstation and all attached SystemTrace Modules. The network is 10/100 Base T using TCP/IP protocol. The network must also support UDP messages. The cable needed for the Communication Network must be a Category 5 or better.

The data interface definition is an open format available to users or 3rd party vendors to support custom data analysis. The Communications Network is required for probe configuration, data upload, or real-time data monitoring. However, once configured, Modules may be detached from the network for unattended data collection. In this configuration, the Modules store collected data until reattached to the Communications Network for later upload.

2.2.3 External Signals and Triggers

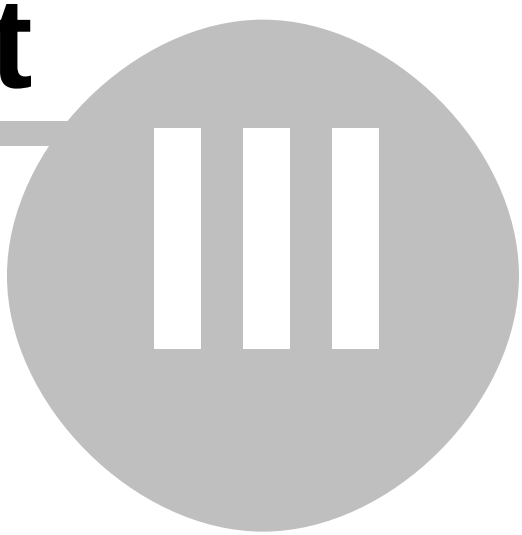
All SystemTrace External Signals and Triggers are differential signals (7 -12 VDC) compatible with RS-485. When a Probe is not actively driving an External Signal, it holds the driver in a tri-state condition so that other Probes or external RS-485 compatible equipment may drive the signal. The signals are pulled weakly to the unasserted state. All SystemTrace External Signals and Triggers have a nominal pulse width of 500ns and are leading-edge triggered.

For more information on External Signals and Triggers, see the "Cabling" section in the Installation chapter.

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3 Graphical User Interface

3.1 GUI Chapter Introduction

This chapter covers the SystemTrace Setup functions and features. Utilization of the features are demonstrated in the
"**What To Do**" sections.
Terms and words used in this manual that are related to SystemTrace attributes are capitalized to distinguish them from their generic uses.

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3.1.1 System Trace User Interface Description

The SystemTrace functions are specified through the User Interface Package (UIP). The UIP is a Graphical User Interface (GUI) to the SystemTrace Resources. It uses windows and pull-down menus to allow the user to setup, control, and analyze the performance of the target system. The User interface is divided into several parts with corresponding windows:

1. Configuration and Control "**Control Console**" window
2. Symbolic address setup "**Symbol Editor**" window
3. Event capture setup "**Session Editor**" window
4. Data examination tools"**Event Table**", "**Event Graph**", "**Event Timing**", "**Run-Time Data**", "**Run-Time Data Table**", "**Run-Time Statistics**" windows.

3.1.2 Theory of Operations

The following is a list of the basic operations required to configure the SystemTrace Resources to perform data collection. Each step contains a link that explains detailed operations.

1. Create the required Symbol Set. The Symbols are contained in a Symbol Set that references symbolic names to system parameters, such as memory locations or bus events.
2. Create a Session which is the data collection scenario used for one or more SystemTrace Channels. This Session will reference a Symbol Table to use when specifying items to monitor. Here, the user will specify events for collection, and indicate action settings for triggers, external signals, and state machine operations. This information is saved to a Database file.
3. Configure the mode for data collection (Snapshot traces or log to disk), default (starting) state for state machine operations, and timer/ counter settings.
4. Start Session. This transfers the parameters to the Modules active in the session and starts collecting data.
5. View the data. The user can observe the Data Items in the Run-Time Data Table at 1Hz sampled rate while the target is running.
6. Stop the Session. Once data collection is complete, indicated by monitor status fields in the display, the user transfers the collected data to the workstation for analysis using the SystemTrace tools.

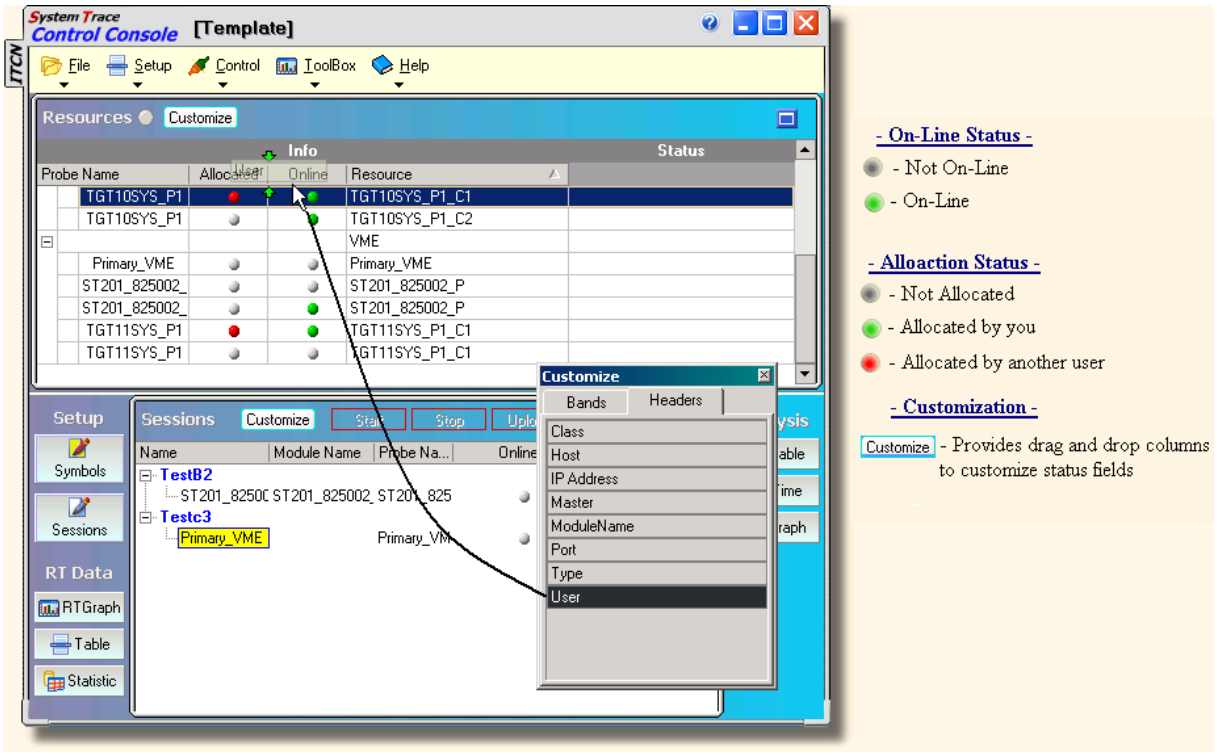
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3.2 Control Console Window

The Control Console Window provides an overview of the SystemTrace instrumentation set (available Resources, setup, and tools) and is the centralized point for controlling tests involving one or more Channels. It also provides access to the other parts of the system, the Session Editor, Symbol Editor, and Analysis tools.

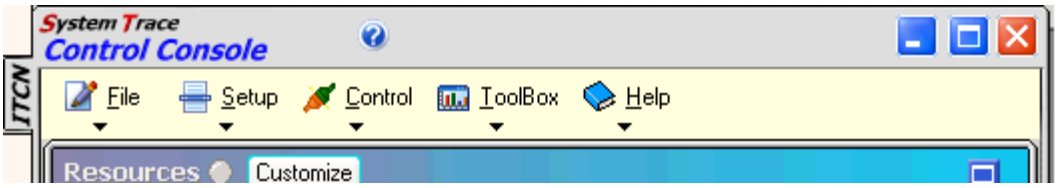
The following sections will reference the figure below and explain its operation. Click on a menu item for more information.



Control Console Window

3.2.1 Control Console Menu Bar

The Control Console Menu Bar provides access to the key parts of SystemTrace User Interface. To learn more about the menu selections, see the following related sections.



Control Console Menu Bar

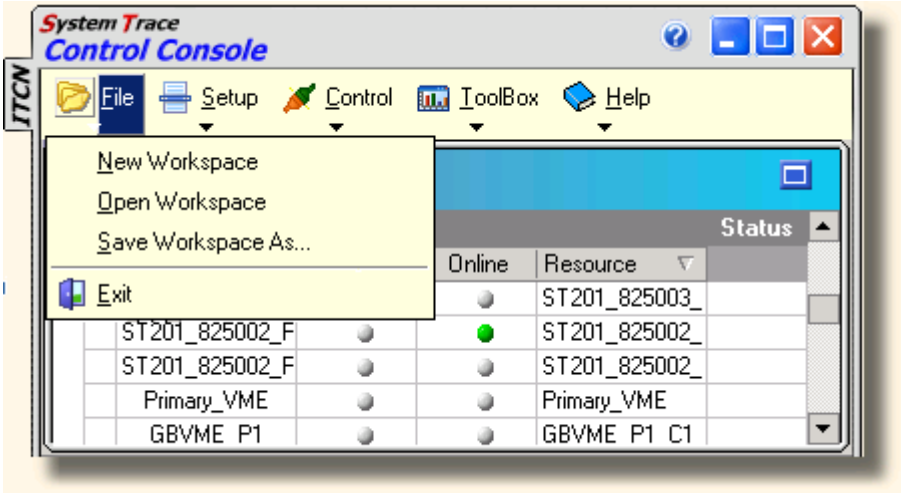
3.2.1.1 File

The figure *Control Console File Menu* shows Workspace menu items. The Workspace provides a means to retrieve or store all the user inputs to SystemTrace, Symbols, Sessions, Events etc… all user data normally entered through the various SystemTrace windows and dialog boxes. Selection of a menu item opens a file dialog to create or open an existing Workspace file.

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The Control Console File menu items are the **starting point** to setting up SystemTrace.



Control Console File Menu

New Workspace
Starts with only default user inputs set, to allow the user to create a new SystemTrace configuration via the user interface.

Open Workspace
Retrieves an existing SystemTrace configuration for execution or editing.

Save Workspace As
Copies your current SystemTrace configuration to a Workspace file with a name that you compose.

What To Do
From the Control Console select File | New Workspace. A file dialog will appear.
Compose and enter a name for the Workspace file you are now establishing. Click the Save button.
From this point, you may proceed to the following sections that will explain how to setup SystemTrace to accomplish your diagnostic goals.

Why
Using Workspace files allows you to keep a collection of SystemTrace user configurations for the various test scenarios you require.
The Workspace file may be carried to other SystemTrace installations.

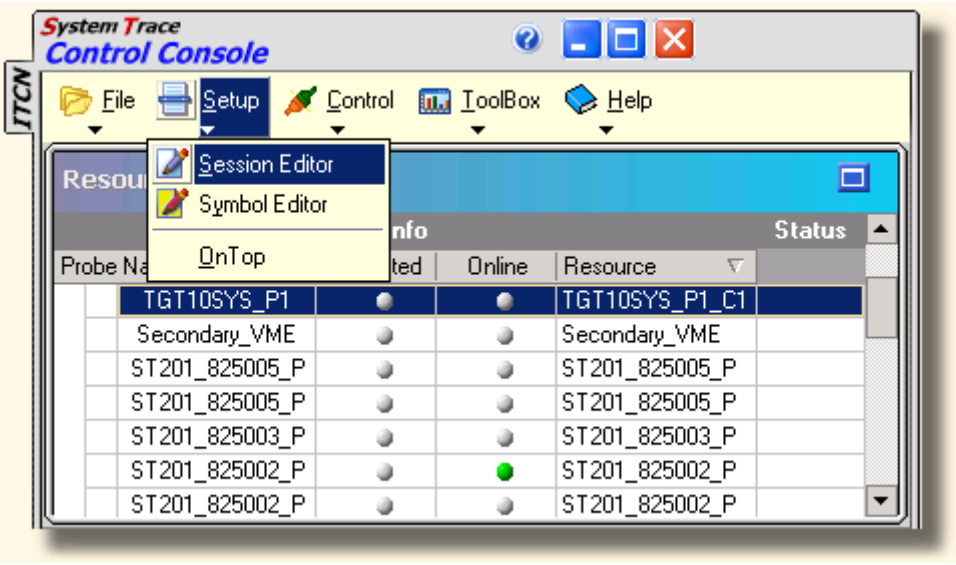
Other Options
The menu item "Open Workspace" can be selected to reestablish a SystemTrace user configuration previously created.
Your current setup may be copied and saved by selecting the menu item "Duplicate Current Workspace".

3.2.1.2 Setup Menu Items

"**Session Editor**" and "**Symbol Editor**" under the Setup menu require user input to collect data. The OnTop is a user preferences. To learn more about the menu selections, see the following related sections. The OnTop is a generic windows operations and can be understood by examination.

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Control Console Setup Menu Items

Session Editor
In order to monitor for system parameters, these parameters must be identified in an Event List. This Event list is populated in the Session Editor. The Session Editor is used to select Symbols from a Symbol list to place in the Event List. In addition, the user can create Event Actions. These actions will define the path and actions of the scenario. The user can create Actions to Trigger, manage State Machine, manage Timer/ Counters, and External Events.
See the Session Editor section for more information.



(Speed Button)

Symbol Editor
In order to select Addresses and events for the Event List, they must first be defined as Symbols in a Symbol Set.
The Symbol Set is a collection of defined addresses, processor, or bus transactions associated with a single name provided by the user and referred to as a Symbol, in which one or more can be selected as an "Event" to be captured. These files may be either manually created or automatically generated using the optional SystemTrace Auto Symbol Translator tool. Selection of "Symbol Editor" from this menu opens the Symbol Editor window. This is where most of the work must be done to define target activities as SystemTrace Events. Creating Symbols and Symbol Sets are covered in the Symbol Editor section.



(Speed Button)

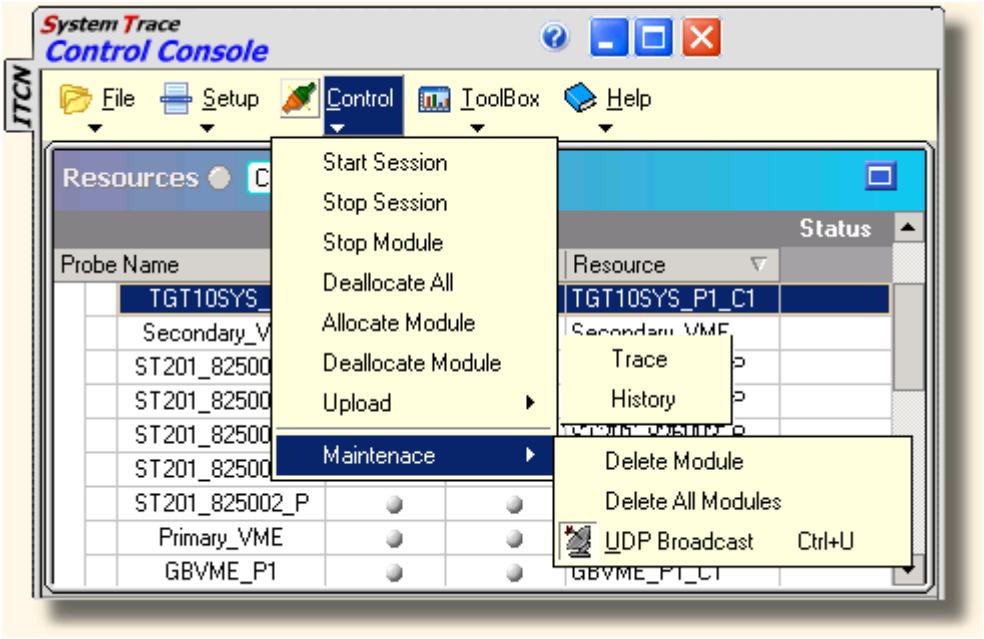
Exit
Closes the SystemTrace User Interface Software.

3.2.1.3 Control Menu Items

The Control Console Control menu provides selections to control monitoring operations, from the Allocation of a Module, starting the Session, stopping the Session and Uploading the collected data to the workstation. This section will explain each of the menu items and sub-menu items shown in the figure below.

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Control Console, Control Sub-Menus

Menu Selections shown in figure *Control Console, Control Sub-Menus* shown above.

Start Session
Automatically Allocates Resources selected in Session, transfers user defined collection scenarios and starts monitoring for defined Events. The software will notify the user of the status. Any Resources not programmed, due to non-selection or error, will be identified.

Stop Session
Stops Monitoring and closes file on all Resourcess in Session for Upload.

Stop Module
Stops Monitoring and closes file on selected Resource (Module) in Resources display for Upload.

Deallocate All
Deallocates All SystemTrace Resources in selected session so they are available for use by others.

Allocate Module
Allocates Resource (Module) selected in Resources Window for use. This prevents other users from using this Resource/ Module. The Module is automatically allocated during a Start Sessin Command.

Deallocate Module
Deallocates Module selected in Resources Window so it is available for use by others.

Upload - Uploads file from Module (selected Resource) to Workstation. This will provide a dialog box to select the filename.

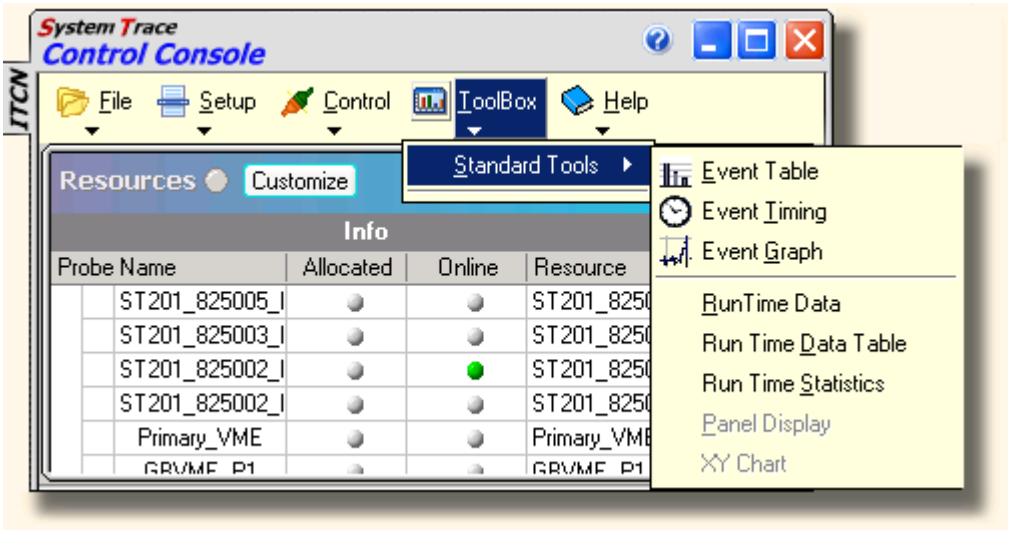
Maintenance
Delete Module- Removes Module from the Resources Window. The Module will be restored if it provides another UDP status message over the network.
Delete All Modules - Removes all Modules from the Modules Window.
UDP Broadcast - Initiates a UDP status request to cause all active Modules to send a status message.

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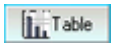
3.2.1.4 ToolBox Menu Item

The figure *Control Console ToolBox Menu* shows the sub-menu items available. All the items on this menu have their own section by the same name within the Analysis section of this users guide.



Control Console ToolBox Menu

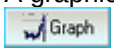
The Standard Tools in this drop-down menu are all for data analyses. They are to be used after all Session setup requirements are completed. The items on this menu can be divided in to two major categories, post Monitor run analysis and Monitor running analysis (RunTime). The first three menu items listed below are the post Monitor run analysis tools. Use these tools to examine captured data after the Monitor has stopped and the Module's data has been uploaded to the workstation. See the Analysis sections for details about these features.

Event Table
A row and column presentation of the collected data.


(Speed Button)

Event Timing
A graphic presentation of Event frequency and place in time relative to other Events.


(Speed Button)

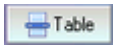
Event Graph
A graphic presentation of Variable values at a point in time.


(Speed Button)

The remaining items on the menu are for observing target activity as it happens (RunTime). See the Analysis sections for details about these features.

RunTime Data
A real-time presentation of variable values as time passes.


(Speed Button)

RunTime Data Table
A real-time row and column presentation of variable values with value trend indicators.


(Speed Button)

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RunTime Statistics
A real-time row and column presentation of counts and percentages of categoric target activities.

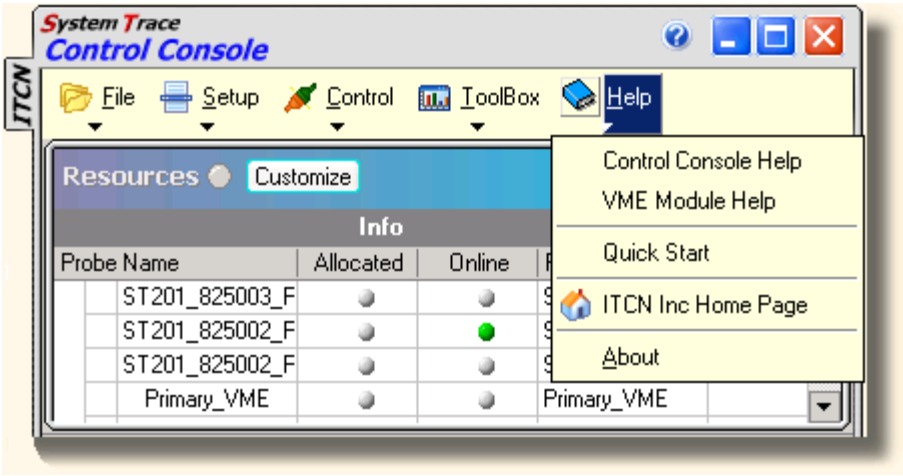

(Speed Button)

Panel Display *(if available)*
A real-time graphic presentation of a variable's values, max, min and present.

XY Chart *(if available)*
A real-time graph of user selected X-variable value versus Y-variable value.

3.2.1.5 Help Memu Item

The Help Menu item provides a link to the master help filethat this manual is based on.



Control Console Help menu

Several chapters of the SystemTrace Users Manual are available from Control Console Help menu shown in the figure above. The use and contents of each help item on the sub-menu is explained below.

Control Console Help*
Opens the chapter that covers operation of the window in which help was selected.

VME Module Help **
Opens the chapter that covers Module and target specific characteristics and operation.

Quick Start
Opens a User Guide with a brief SystemTrace setup procedure. Information on Analysis is also provided.

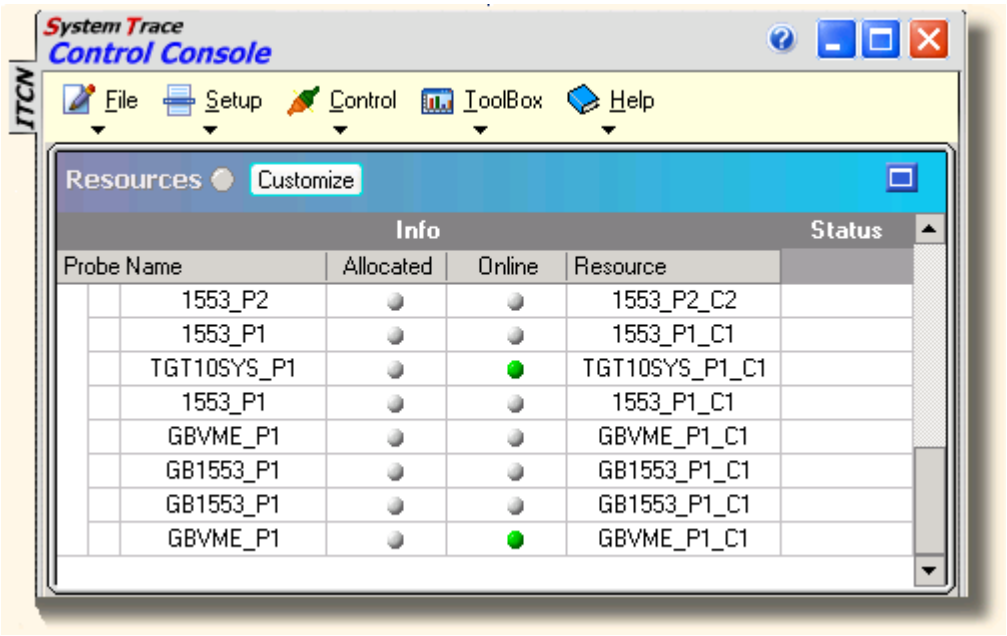
** Menu item name is relative to the window open e.g. "Session Editor Help" for Session Editor window.*
*** Menu item name is relative to the Modules in the SystemTrace installation e.g. "1553 Module Help" for an installationwith a 1553 Module.*

3.2.2 Resources Pane

The Resources pane of the Control Console Window shown below provides status information about the Modules on your SystemTrace installation. Right clicking pops-up a menu to allow the user to delete the selected or all Modules from the list

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Control Console Resources Pane

Module LED's:
The figure Control Console Resources Pane shows the Resources LED. The UDP LED, next the word 'Resources', flashes when ever a UDP status packet is transmitted. The transmission occurs at regular intervals, but a packet transmission can be forced by clicking on the LED. In the On-Line column the LED indicator reports that the Module named in this row is attached to the network and has an IP addressed assigned. Modules communicate to the workstation though a LAN. An LED in the OnLine box indicate connections and configuration for network communication are complete. If the LED is on (green) the Module is running. The Allocated LED tells if the Resource is in use by you (green), by someone else (red), or not used (gray).

Other Options
If the **On-Line** LED is Gray, then the Resource has been seen in the past by this Workstation, but is not currently operational or on-line.

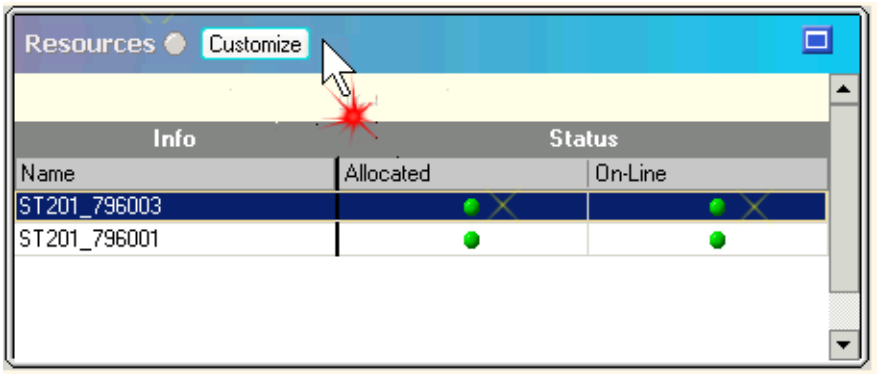
SPECIFICATIONS:
Maximum number of Modules on a LAN: 32
Network: Ethernet 10/100 Base T, TCP/IP

NAME:
The left column of the Resources pane lists the Names of all Resources available. Refer to the figure *Control Console Resources Pane.* Highlighting the Resource's row in the pane selects it for other operations.

CUSTOMIZATION
This Customize Button opens the Customize dialog window that allows the user to rearrange, add or delete the columns in the Resources pane. Figure *Customize Dialog, Headers and Bands* shows that the "Bands" tab sets up column categories in the first row of the pane, and "Headers" sets up column headers in the second row. For example, the user could drag "Status" from the Customize dialog under the "Bands" tab up to the first row in the pane to establish a status column category. The Headers, Allocation, and OnLine from the Headers tab could be dragged under the Status column category.
These same operation are also available for the Session pane.

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Control Console Resources Window

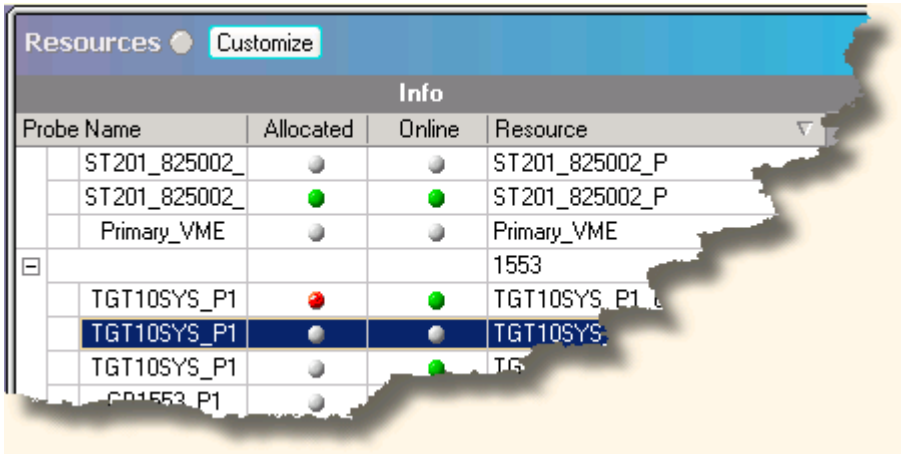


Customize *Dialog, Headers and Bands*

3.2.3 Channel Allocation

The "Allocated" column in the Control Console Resource pane indicates which Resources are in use by persons on the network.

Refer to the figure *Control Console: Resources Window:* A Green LED under the "Allocated" column indicates you have the Resource Allocated, Red indicates someone else has it Allocated, and Gray indicates no one has it Allocated. When you select and Allocate a Resource you are reserving the Resource for your exclusive use.



Control Console: Resources Window

What To Do
Highlight the desired Resource in the Control Console's Resources pane. From the Control Console menu bar, select "Control"then "Allocate Module" from the drop-down menu Shown in the figure *Control menu drop-down menu*.



Control Console: Control Menu

Why
This is how you claim the Resource for your exclusive use.

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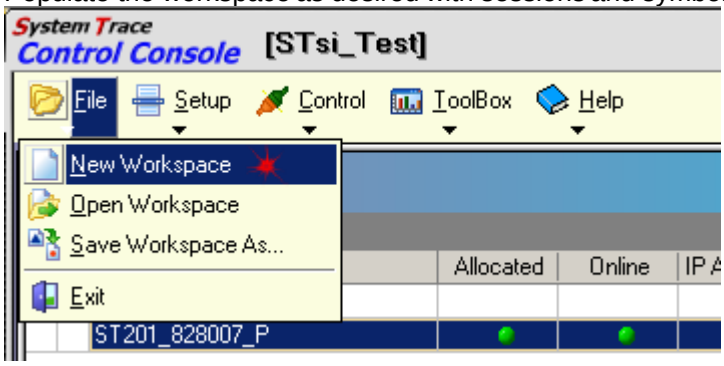
Other Options
If the LED is red you can not use this Resource because someone has allocated it for their use. If the Resource is Allocated but not being used, ask the user to deallocate this Resource.

Specifications
Maximum number of Resources that can be allocated at one time: All in available list.

3.2.4 How to Create a Workspace

A Workspace is simply a single file containing all of the Session and Symbol Set information created while it is active. This serves the pupose of easy configuration control and user customization. A user may wish to create his own Workspace to store all Session and Symbol Sets or multiple Workspaces for different test configurations.

What To Do
In the Control Console menu, select File| New Workspace.
Populate the workspace as desired with sessions and symbol sets.



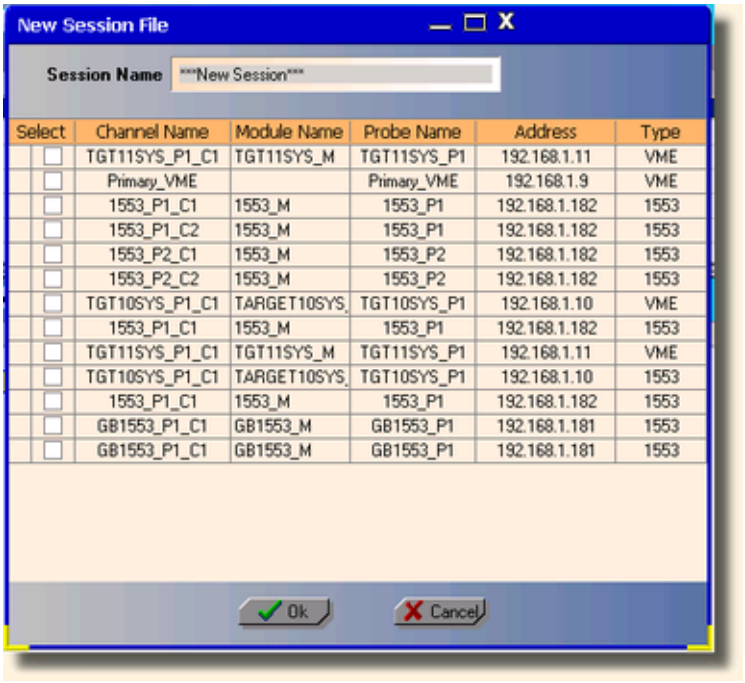
Creating a new Workspace File

3.2.5 How to Create a Session

What To Do
Right click anywhere in the Sessions pane, then click on "New Session" in the resulting pop-up menu.
Enter a name in the New Session dialog window and check the box next to the Resource name(s) you wish to work with and click OK.
You have now established a Session with one Resource ready for Event and Action definitions. The sections that follow will guide you through the remaining Session Requirements of Symbol and Symbol Set creation.

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New Session File Dialog

WHY

This procedure allows the user to create a SystemTrace file that holds user defined test. All Resources used for the test are grouped under one Session name.

3.2.6 Session Pane Description

The Sessions pane Provides a list of Session scenarios as shown in the figure *Control Console Session Pane* under the "Name" column. The blue text represents the session name. Resources may be added to a Session by dragging the desired Resource from the Resources pane above to the Session pane below. A Session contains the parameters (Events, Event Actions, data collection mode…) set up by the users for each Resource selected to run a test. Clicking on the crossed box (⊞) next to the Session name displays all the Resources within the Session as shown in the figure *Control Console Session Pane.*

Type

The Type column indicates the kind of Resource the Session is utilizing such as VME or 1553.

On-Line

Resource is On-Line and ready if green, not ready if gray. Session row (above the associated Resource rows) On-Line LED indicates when green that the Session can run with one or all of its Selected and On-Line Resources.

Selected

Check this box to Select Sessions and Resources. Resource is selected for use in the current Session. If the user checks the Selected box for the Session, then all Resources are automatically selected. If a Resource is not available upon checking the Session Selected box, the On-Line LED will be gray and the Session may not be run. In this case select individual available (green On-Line LED) Resources to run the Session.

Custom Fields

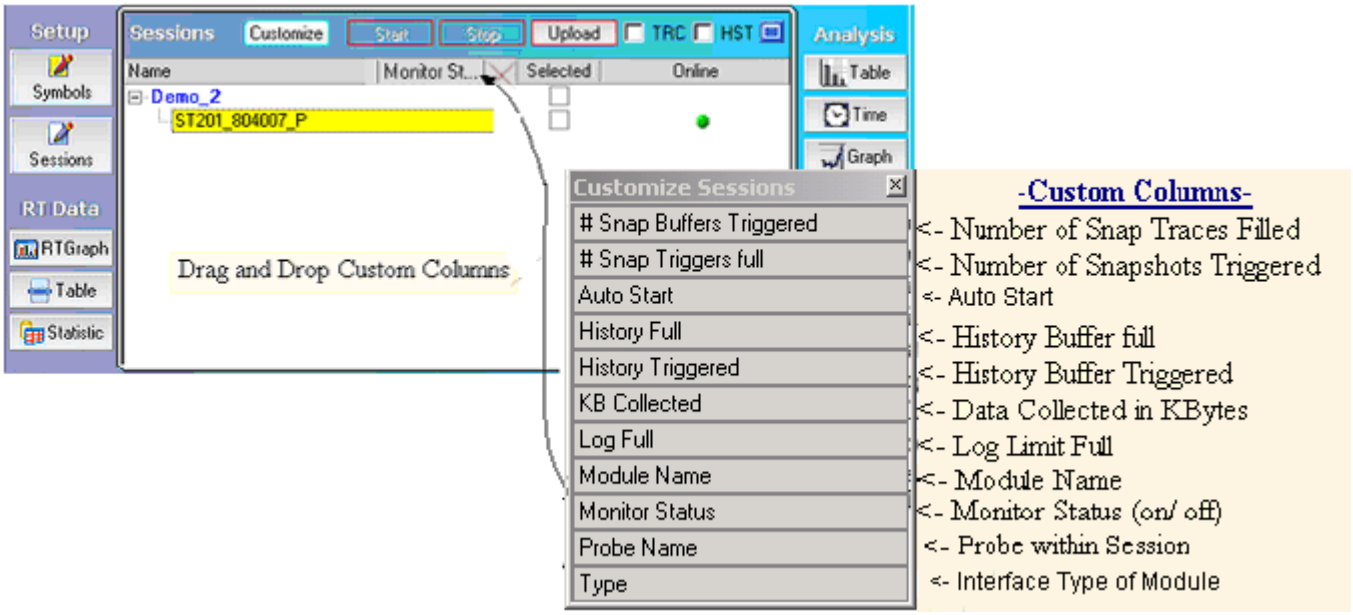
The user can drag and drop custom status columns from the Customize dialog, which is opened using the Customize button.

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Session/ Symbol File Set

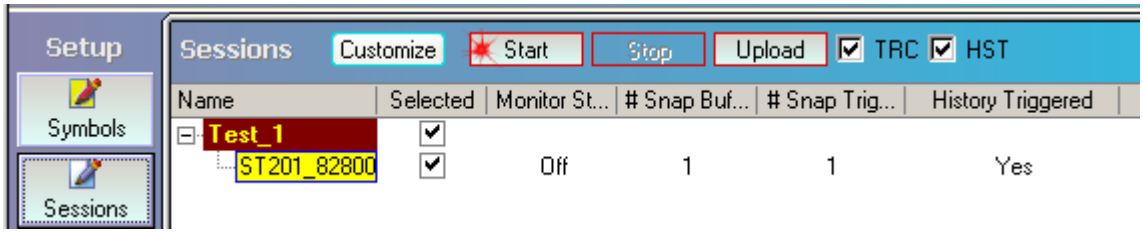
If there are icons present in the display, this indicates a physical file is in use for the Session File (blue disk icon) and Symbol Set (red disk icon).



Control Console Session Pane

3.2.7 How to Start a Session

To start monitoring data, the user must start the Session. This is accomplished by selecting the desired session checkbox in the Session pane of the Control Console.



Starting a Monitor Session

3.2.8 How To Stop a Session and Upload Data

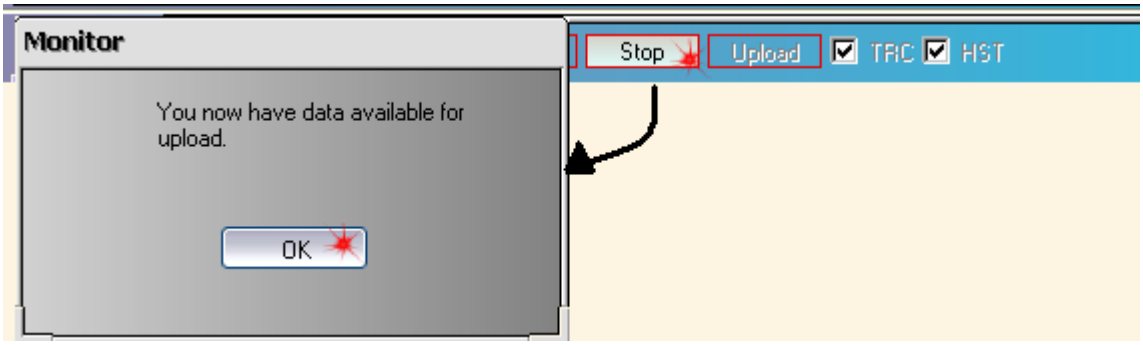
Stop the Session by selecting the STOP button on the Sessions pane in the Control Console. The GUI will notify the user that the Session is stopped and that data is ready for upload.

What To Do

Stopping the Session - Click STOP on the Session window

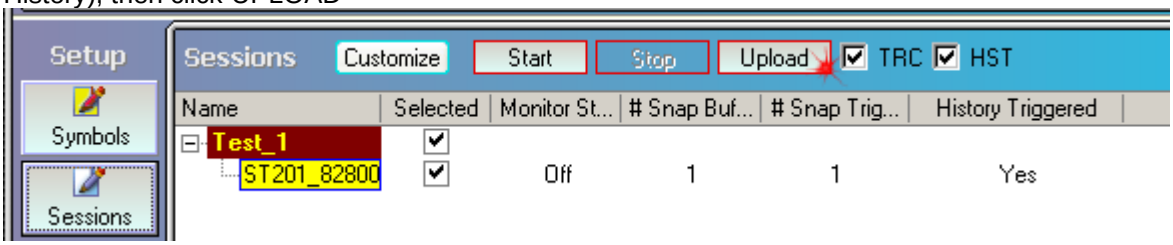
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Stop a Monitor Session

Upload - Select the desired Resource in the Session, then select the files to upload (Trace, History), then click UPLOAD



Upload Collected Data

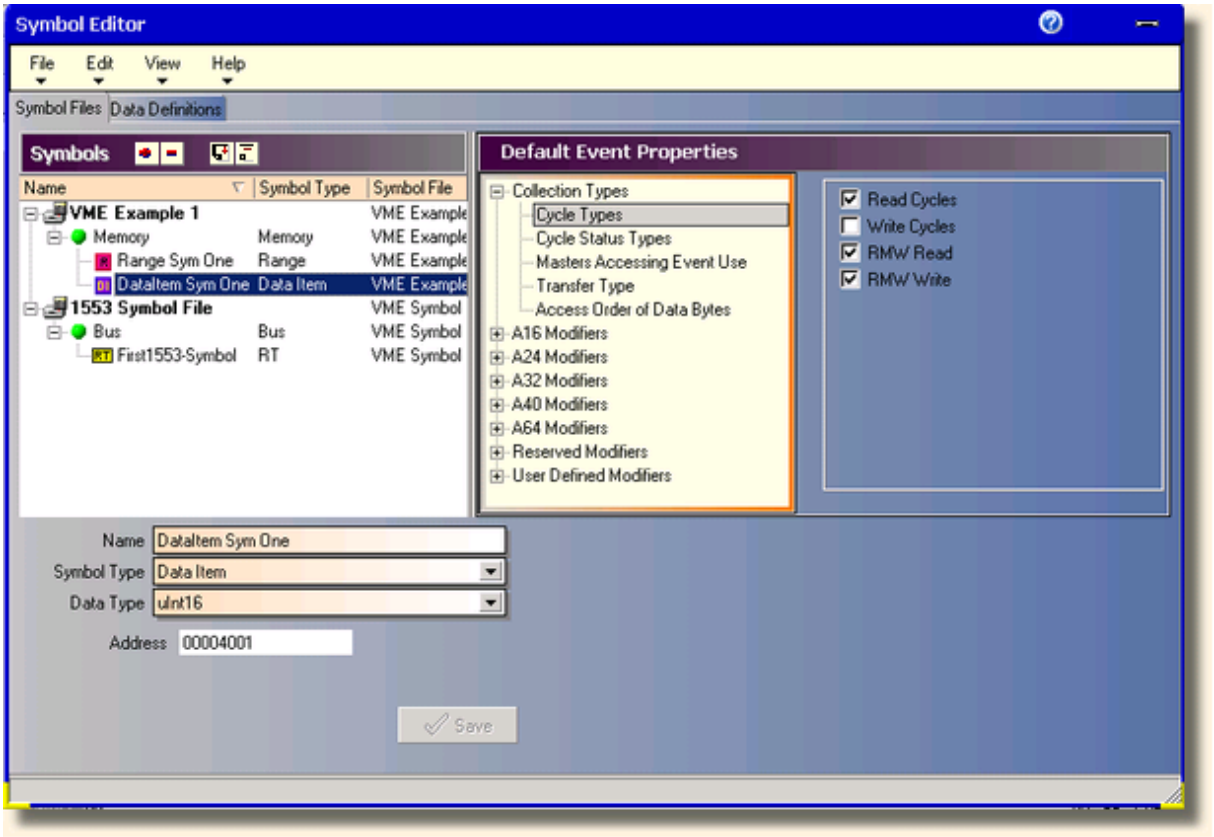
3.3 Symbol Editor

3.3.1 Symbol Editor Chapter Introduction

This chapter covers System Trace Symbol Editor functions and features.
Utilization of the features are demonstrated in the"**What To Do**" sections.
Terms and words used in this manual that are related to SystemTrace attributes are capitalized to distinguish them from their generic uses.

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Symbol Editor Window

The figure above shows the Symbol Editor window divided in to two panes, Symbols and Default Event Properties. The Symbols pane can be expanded to accommodate additional columns with more information about the Symbols. This Symbol Editor window configuration is shown and explained in the figure that follows.

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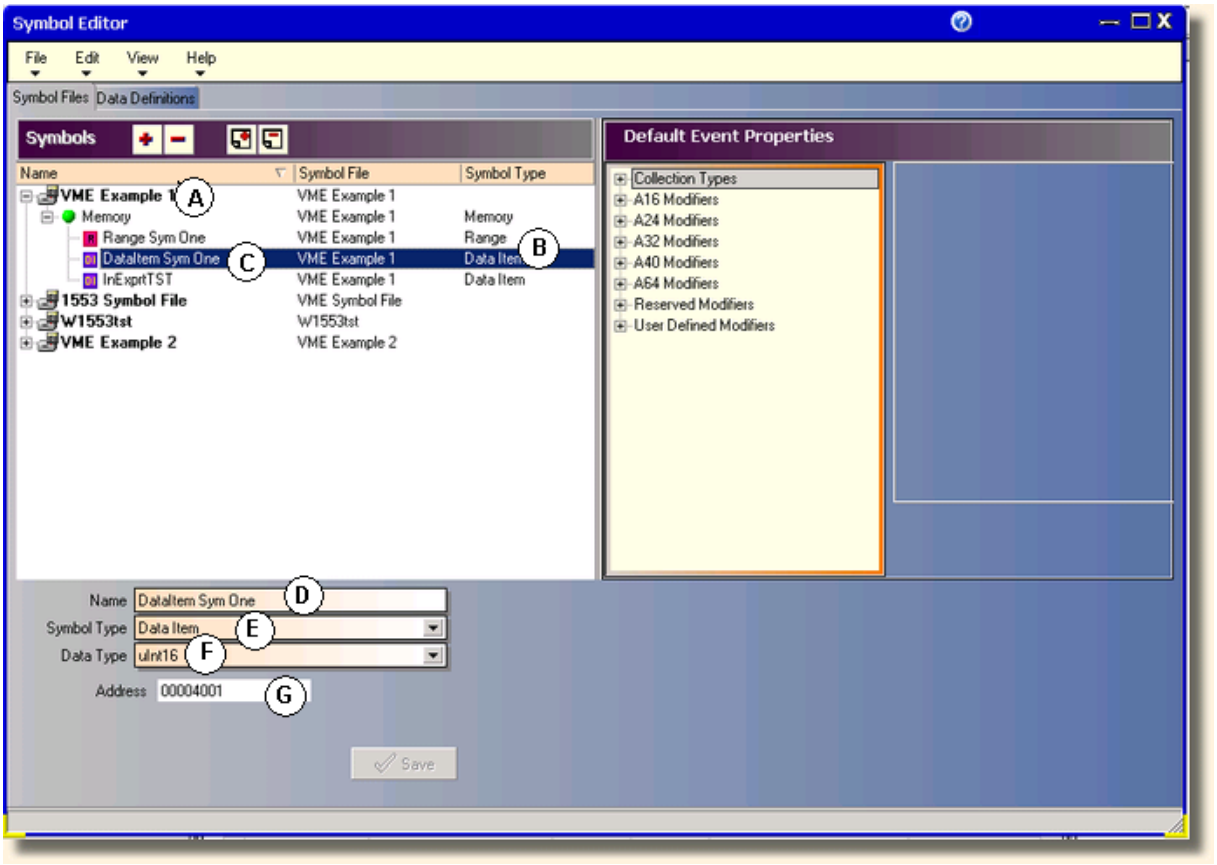
3.3.2 Symbol Editor Window

The "Symbols" window provides the tools to establish Symbol Sets, and create or edit the Symbols that are stored within these Symbol Sets.
The Symbol Set is a collection of defined processor or bus transactions (Symbols) associated with a single name provided by the user, and referred to as a Symbol Set. The SystemTrace "Symbols" window provides the means to create a new Symbol Set or modify an existing Symbol Set. The Symbol Set provides the basis for non-intrusive Monitor test setup. Symbol Sets may be searched for individual Symbols.
Refer to figure *Symbols Window* as indicated in the following sections.

If you have purchased an Auto Symbol Translator, see the accompanying manual.

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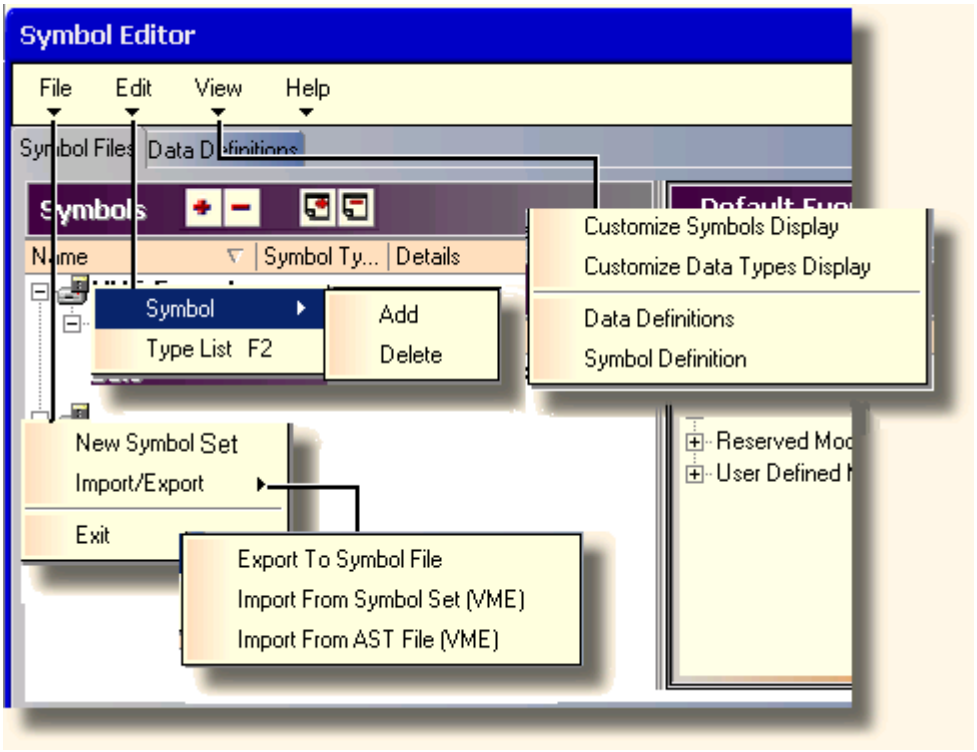
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Symbols Window

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3.3.2.1 Symbol Editor Menus



Symbols Window Menus

Refer to the figure *Symbols Window Menus* above for the follow descriptions of the menu items.

File

New Symbol Set Opens a dialog to establish a new Symbol Set, shown in the *Symbol Set Dialog Box* figure and explained in the next section "Creating a New Symbol Set".

 These buttons provide a short cut to add and delete Symbol Sets.

Import/Export

Export To Symbol Set:
Save the Symbol Highlighted in the Symbol Editor window Symbols pane to an existing Symbol Set.

Import From Symbol Set:
Retrieve Symbol(s) from an existing Symbol Set and add it to the Symbols pane for use in the current Session.

Import From AST File:
Bring in the Symbol from the output file of the Auto Symbol Translator (AST) and establish them as a Symbol Set.

Exit

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Closes the Symbols window.

Edit

Symbol

Add

Add a Symbol to a selected Symbol Set or a child Symbol to a selected Symbol within the Set.

 This button a is shortcut to perform the same function as the Add | Symbol menu items.

Delete

Deletes a selected Symbol within a Symbol Set.

 This button a is shortcut to perform the same function as the Delete | Symbol menu items.

Type List

Opens the Data Definitions window, same as clicking "Data Definitions" tab.

View

Customize Symbols Display

Opens a dialog to add or remove columns to the Symbol Display. See the "Control Console Window" for details.

Customize Data Types Display

Opens a dialog to add or remove columns to the Data Definitions Display. See the "Control Console Window" section for details.

Data Definition

Opens the Data Definitions window, same as clicking on the tab "Data Definitions".

Symbol Definition

Opens the Symbols window, same as clicking on the tab"Symbols".

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3.3.2.2 Opening Symbol Editor

To Open the Symbol Editor, click the Symbol Editor button in the Control Console Sessions Pane as shown in the figure below.



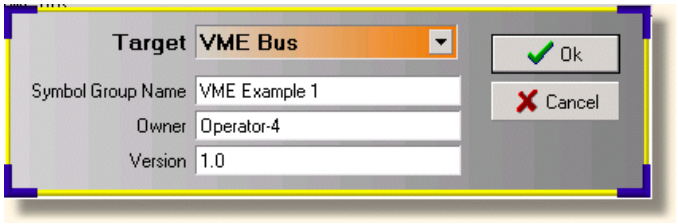
Control Console Symbol Editor Button

3.3.2.3 Creating a New Symbol Sets

A new Symbol Set is created to store a collection of Symbols that are created by the user. The sections that follow this one explain how to create Symbols that can be additions to an existing Symbol Set or for a new Symbol Set. Follow the procedure below to create a new Symbol Set, then proceed to the following sections for instructions on how to create Symbols that will be stored in the Symbol Set.

What To Do

From the Symbol Editor menu bar select, "File" then "New Symbol Set" from the drop-down menu.
Click on the in the "Target" text box at the top of the dialog box shown in figure *Symbol Set Dialog Box*. Select one of the available targets from the drop-down list.
In the "Symbol Group Name" text box compose and enter a name for the new Symbol Set and click "OK".
Your Symbol Set name will appear in the Symbol Editor's Name column.
Compose and enter in the "Owner" box a name that represents responsibility for the entries above and the new Symbol Set.
Enter any number in the "Version" box.



Symbol Set Dialog Box

Why

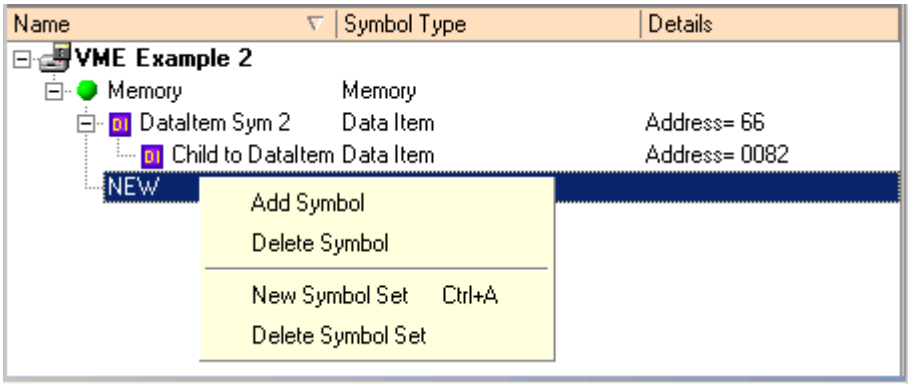
A storage place is needed to send the Symbol to as they are created by the user. These Symbol are descriptions of an activity/event on the target. The Symbol Set will be assigned to a Module and the Symbols within the Set will be selected by the user and put in an Event pane of the Session window. When a Symbol is selected for an Event it is further defined by selecting the Edit Events button to open the Collection Type pane.

Other Options

Right clicking within the Symbols Editor Symbols List pane opens the menu shown in the figure below *Symbol Editor Pop-up Menu*. The "Delete Symbol" and "Delete Symbol Set" require the careful selection of the items in the Symbol pane before selecting these menu items for execution. A selection is indicated by the highlighted row, the figure shows "NEW" selected, meaning that it could be deleted or have a child symbol added to it by selecting the "Add Symbol" menu item. "Delete Symbol Set" will delete the Symbol Set if any of its Symbol are selected.

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Symbol Editor Pop-up Menu

Add and Delete Symbol Set button at the top of the Symbol Sets pane perform the same functions as the right click menu item described above, these button are shown in figure below *Symbol Set Add Delete Buttons (A)*.



Symbol Set Add Delete Buttons

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3.3.2.4 Adding Symbols To Symbol Set

The Name column in figure *Symbols Window (A)* show the Symbol Set name at the top. In this illustration it is "VME Example 1". This name is composed by the user. Under the Symbol Set name is the target Section, designated with a green ball (●). The Section is named relevant to the target when the Symbol Set is established, in this illustration "Memory". Symbols are created by the user and existing ones edited under the target Sections as shown in the figure *Symbols Window* (C). Additional Symbols may be created as children to parent Symbols.
The Symbol tree is expanded by clicking on the ⊞ next to the Symbol or File name to reveal the parent – child relationship.

What To Do
To add a Symbol to an existing Symbol Set, such as the VME Example 1 file in figure *Symbols Window (A),* Right click on a name under VME Example 1 and select "Add Symbol" from the pop-up menu. [CAUTION: be sure you DO NOT select "Add Symbol Set"]. A grayed row will appear at the bottom of the VME Example 1 Symbol tree.
In the dialog box shown in the figure *Symbols Window* (D) enter a name for the new Symbol.
See the next section for the next step in adding a Symbol to an existing Symbol Set.

Why
To capture any part of a target's activity it must be described to SystemTrace in order to be recognized as and Event. The Symbol Editor is the dialog where this description is formulated and packaged as a Symbol with a name composed by the user and saved in a file with other Symbols, this is the Symbol Set.

Other Options
In the above example we took the first steps to add a top level Symbol to the Symbol Set by highlighting (selecting) the Section name. We could have highlighted any Symbol name under the Symbol Set name such as "Range Sym One" shown in the *Symbols Window* figure (C) and followed through with the same procedure to create a child Symbol of "Range Sym One".
Scoping relationships in the Symbol Set allow duplicate Symbol names to coexist in the same file. This concept is analogous to programming language scoping which allow duplicate Symbols to coexist within the same operational program.
Shortcut buttons at the top of the Symbol Sets pane perform the same functions as the right click menu items described in the above What To Do paragraph. These shortcut button are shown in the figure below, Symbol Add Delete buttons (A).



Symbol Add Delete buttons

Existing Symbol Sets can be brought in for editing using the Import From Symbol Set and Import From AST selections under the File item in the Symbol Editor menu bar. See "Symbol Editor Menus" Section for more about these menu selections.

SPECIFICATIONS:

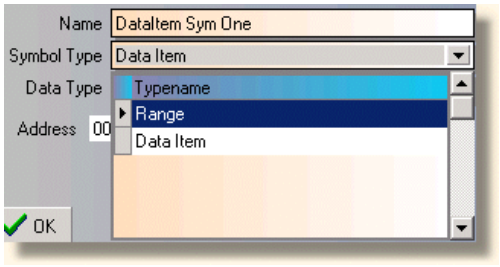
Symbol Scoping limits:	Beyond practical use.
Sections Per Symbol Set	Determined by Module type software

3.3.2.5 Symbol Type

Figure *Symbols Window (E)* is where the general Symbol type is selected, The figure below *Symbol Type Menu* shows the expanded menu".

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Symbol Type Menu

- "Range" is used when the target event of interest is expected to occur between a specified starting address and ending address. Figure *Symbols Window (G)* shows where the dialog boxes to enter a Min. Address and Max. Address would be. Range Symbols are associated with contiguous words of memory in the target. The range can be an array of data or a set of operational program instructions. Range Symbols are created in a similar fashion as Data Item Symbols.
- "Data Item" is used when the target event of interest has a known address. Data Item Symbols define information about operands in the operational program running on the target. From a Monitoring perspective, each Data Item is essentially a variable associated with an address that is made available on the target bus as the operational program(s) executes. The data item may be a particular data word, a bit field within a data word, or a combination of multiple data words. SystemTrace uses Data Item Symbols for Monitor Event specification, Runtime Event displays and post-run data reformatting.

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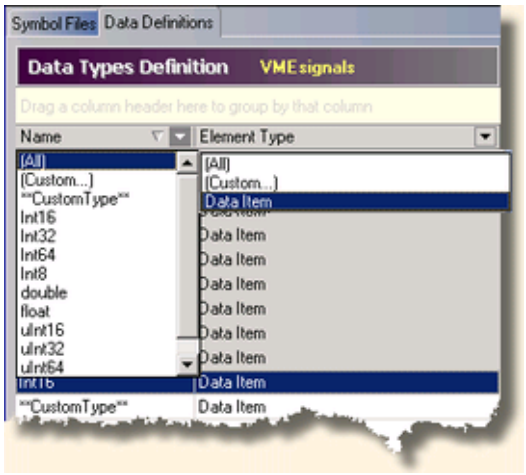
3.3.2.6 Symbol Data Type

NOTE: *The Type selections available are dependent on the Module type, therefore some selections referred to in the following sections may not be present on you Symbol Editor*

The Symbol Editor provides the means to create your own Data Item type definitions. These definitions are based upon default hardware types supported by the Symbol Editor (Symbol Set tab). The default types have gray background rows in the Data Definition window. Custom Types if any, are identified by a white background row.

Symbol Data Type are select in the Data Definitions window that is opened along with the Symbol Editor and under the "Data Definition" tab shown in figure *Symbols Window*.

Using a Menu to View Data Type Categories
In figure *Data Type Sort Dialog* the drop-down menu may be used to sort-out the Data Types in the Data Definition display. This figure shows each of the drop-down menus and the available selection for sorting. Using these menu selections in combination can put a finer point on the sort and display results.



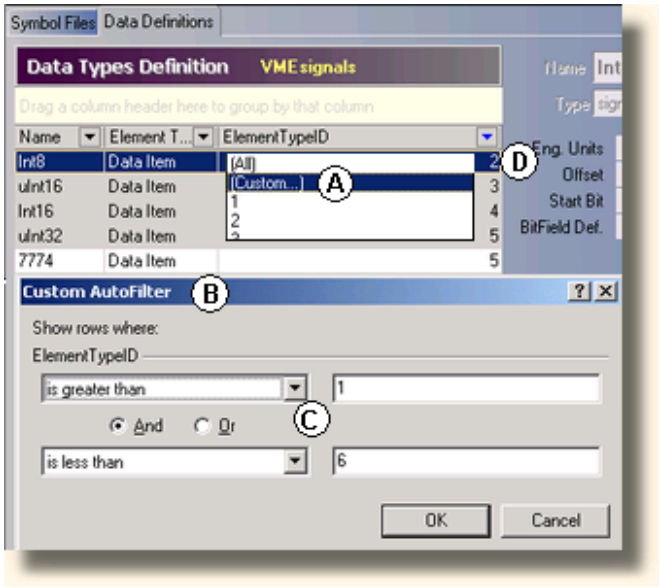
Data Type Sort Dialog

The figure above, *Data Type Sort Dialog* shows "All" selected in the Name column and "Data Item" selected in the Element Type column. This selection allows only Data Item types to be listed as can be seen underlying the drop-down menus. To list all types, select "All" in both columns. Clicking on a row will display the details of the type in the right portion of the Data Definition window.

Use the "View " | "Customize Data Type Display" menu items to add more columns to the pane, allowing a more detailed sort. An example of a "Custom" sort is shown in the *Custom Data Type Sort* figure below, refer to this figure for the following explanation.
Selecting "Custom" (A) from any of the drop-down column menus opens a logical sorting dialog box (B). The entries (C) in this dialog result in a logical Data Type sort shown at (D); note the correlation between the numbers shown at (C) and (D).

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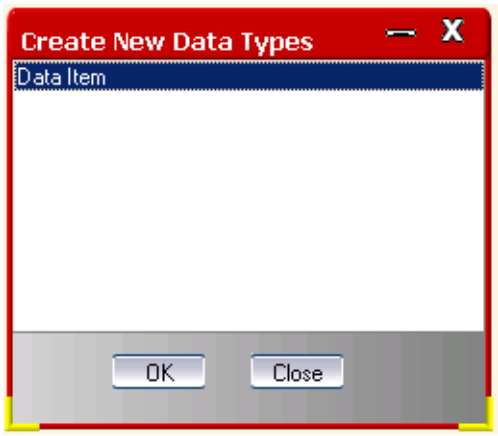
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Custom Data Type Sort

3.3.2.6.1 Creating Data Types

Custom Types have element that must be specified. Additional dialogs will be presented for user specification input. As with all the other Data Types a name that is meaningful to the user may be assigned. Each of the types listed in the figure *Custom Data Types* will be explained in the following sections.



Custom Data Types

Note: Some installations have selections in the "Create New Data Types" window, other than the one in this example. If you selected one other than the example, proceed to the corresponding section.

What To Do

From the Symbols Window select the target section (green ball) then right click and select "Add Symbol" from the drop-down menu.
Enter a name in the name box shown in figure *Symbols Window* (D).
In the Symbol Type box under the Name box ((E) in the *Symbols Window* figure) click on the ▼ and select Data Item from the drop-down menu.
The Data Type Dialog box under the Symbol Type dialog box is where you will select your Custom Type, **after** it is created.
Click on the Data Definition tab to display the Data Definition dialog window.
Click on the Type List (Type List) button to open the "Create New Data Types" selection window shown in figure *Custom Data Types.*
Select Data Item type from the window, click OK and proceed to the "Data Item" section that follows.

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Return / Continue here after the Custom Type is defined.
Click on the Symbol Editor tab and click on the Data Type and scroll down to find the name you composed for the your Custom Data type.
Note: The Symbol you are assigning the new data type to must be highlighted in the Symbols window. If it is not visible be sure all items are expanded by clicking on the ⊞.

Enter the Address for your Symbol (G) in figure *Symbol Editor Window.*

Your Custom Data Type will now appear in a white row in the Data Definition pain and be available in the Data Type drop-down selection in the Symbol Editor window (F) in the *Symbols Window* figure.

Why
The Custom Data Types allow the user to create Event definitions that match software structures used in the target's operating program. With Enumerated types the Event can be defined down to single a bit to capture a very specific operation.

Other Options
The Custom Type could have been a child of any Symbol within the Symbol Set, just select (highlight the row) a parent Symbol and proceed as described in the "What To Do" section.

An existing Symbol Data Type can be edited by selecting its Symbol in the Symbols Window. Select the data type by name in the Name column of the Data Definition pane, then follow the procedure above in "What To Do".

3.3.2.6.1.1 Data Item

The Data Item type allows you to assign specific characteristics to a hardware data type to create a new Data Type. As an example, an operational program may have unsigned word variables that contain a 3-bit field with values for a certain I/O location. The bitfield might only accept values 001, 010, and 100. Using the bitfield and enumeration capabilities of Data Definition Editor, you can define a data item symbol type that expresses these characteristics symbolically.

What To Do (If"Data Item" was selected in the "Create New Data Types" window.)

Refer to the figure Data Definition Window below for the following procedure.

After clicking on "Data Item" the Data Item Enumeration dialog appears as shown in the figure *Data Definition Window (J)-(K).*
The window has several properties for the type definition. To define each of the properties, click on the appropriate attribute dialog box an enter the desired value. The properties for a Data Item Type are as follows:

Name (A) – enter a name for the Data Item Type.

Engineering Units (D) – if applicable to your type, enter the name of a unit of measure for the type (e.g. nautical miles, meters/second, feet AGL, etc.)

Scale (C) – if applicable to your type, enter a floating point number which SystemTrace uses to multiply the variable each time a value of this type is displayed.

Offset (E) – if applicable to your type, enter a floating point number which SystemTrace uses to add to the variable each time a value of this type is displayed. SystemTrace always applies Scale first, then Offset.

HW Data Type (B) – this is the native data type upon which the new data item type is based (e.g. uInt8, Int32, float etc.). No user defined types may be used for this property.

Bitfield Definition (H) – select from the drop down list box the kind of numerical representation used

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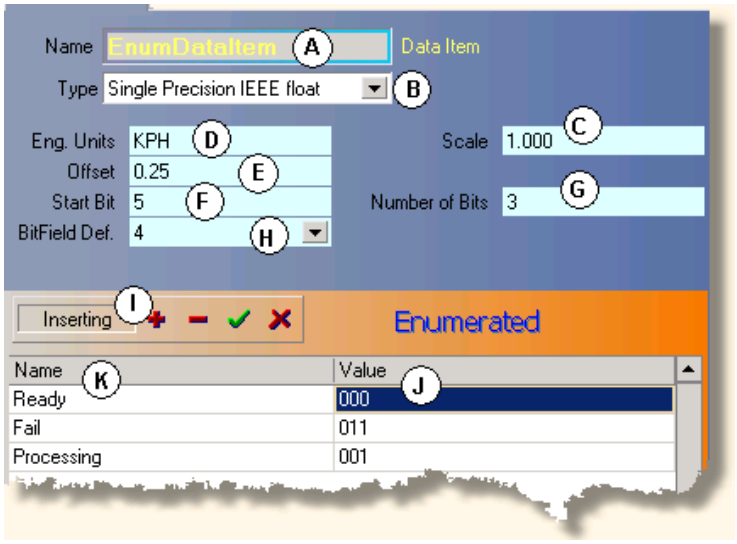
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in the bitfield defined by the Data Item Type. If the Data Item Type does not contain a bitfield, indicate that by selecting "Not a bitfield".

Start Bit (F) – if this is a bitfield, define the start bit (least significant bit) of the bitfield. SystemTrace defines zero as the least significant and first bit of the hardware data type.

Number Bits (G) – if this is a bitfield, define how many bits are in the field.

Enumerated (J) and (K) – if the new data item type supports a defined set of valid values, use Enumerated to assign a symbol name to each value for the type. Click (I) for blank row to enter an Enumerated assignment. This row is shown at (K) in the figure *Data Definition Window*. Click on "Value" row (J) to enter a value for the Enumeration. Do this for every valid value the data item can have. Note that Enumerations can be applied to bitfields or to data Types with no bitfields. If you need to delete an Enumeration value, in progress click on (I). To delete an existing Enumeration click on (I).
Once all the attributes are defined for the Data Item Type, click on (I). The Data Item Type can now be used as the type for Data Item Symbols.
Return to the previous section for and explanation of how the new custom data type is assigned.



Data Definition Window (With Bitfield List)

Why
Using custom Data Item Definition Symbols gives SystemTrace a very specific target event to look for while allowing the user to create a more meaningful Data Type relative to the program running on the target. SystemTrace will react to the occurrence of this Data Item as directed by the user's setup in the Action dialog.

Other Options
Any of the available data type can be selected for all the data Elements within the Structure.

3.3.2.7 Default Event Properties

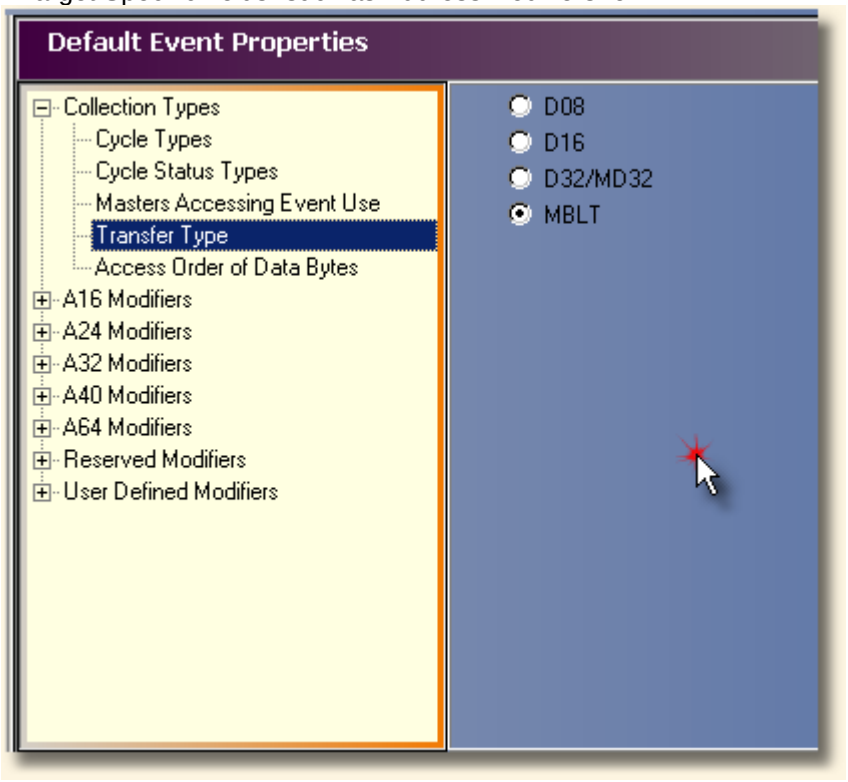
Every Symbol has special properties associated with it. Depending on the Target type, the user can specify to qualify the Symbol against these properties. The default will include all properties enabled. Certain properties are exclusive of one another, in this case, the logical more rational selection is used. Since SystemTrace™ supports multiple Module/ target types, each target's custom properties are explained in detail in the Module Specific section(s) of this Manual. In general, Default Event Properties will include things such as:

- Collection Access Types: such as VME D08, D16, D32, MBLT, etc.
- Collection Cycle Types: such as Reads, Writes, etc.

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- Target Specific fields: such as Address Modifiers for VME



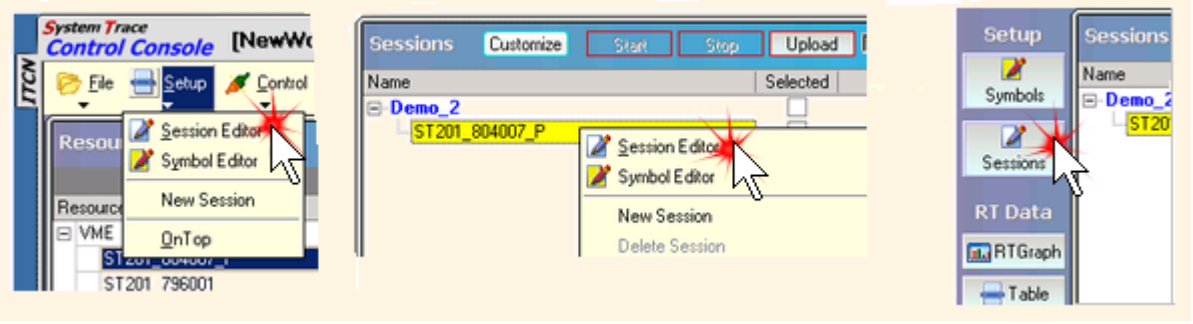
Default Event Properties

3.4 Session Editor

The Session Editor provides access to two applications required to configure the Session, or test sceanario: Event Editor and Advanced settings.

Opening Session Editor

The Session Editor is opened from the Control Console from several menu selections/ buttons. The Session Editor window will open for the Session selected in the Control Console Sessions pane.



Opening Session Editor

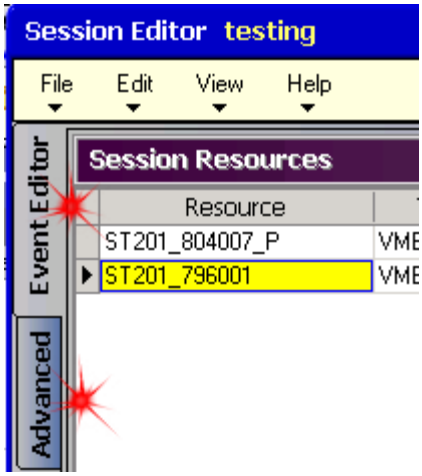
Session Editor Window Tabs

The Event Editor, provides a means for programming which items from the Symbol Table the user would like to capture as well as some basic trigger and recording mode configuration. The Advanced screen provides a means for configuration of the Condition/ Action settings for each Event. The Action List on the Advanced tab provides a means for configuring the state machine and timer/ counters. Use the Session Editor Window tabs to access the two utilities. Event Editor is open as

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default.



Session Editor Window Tabs

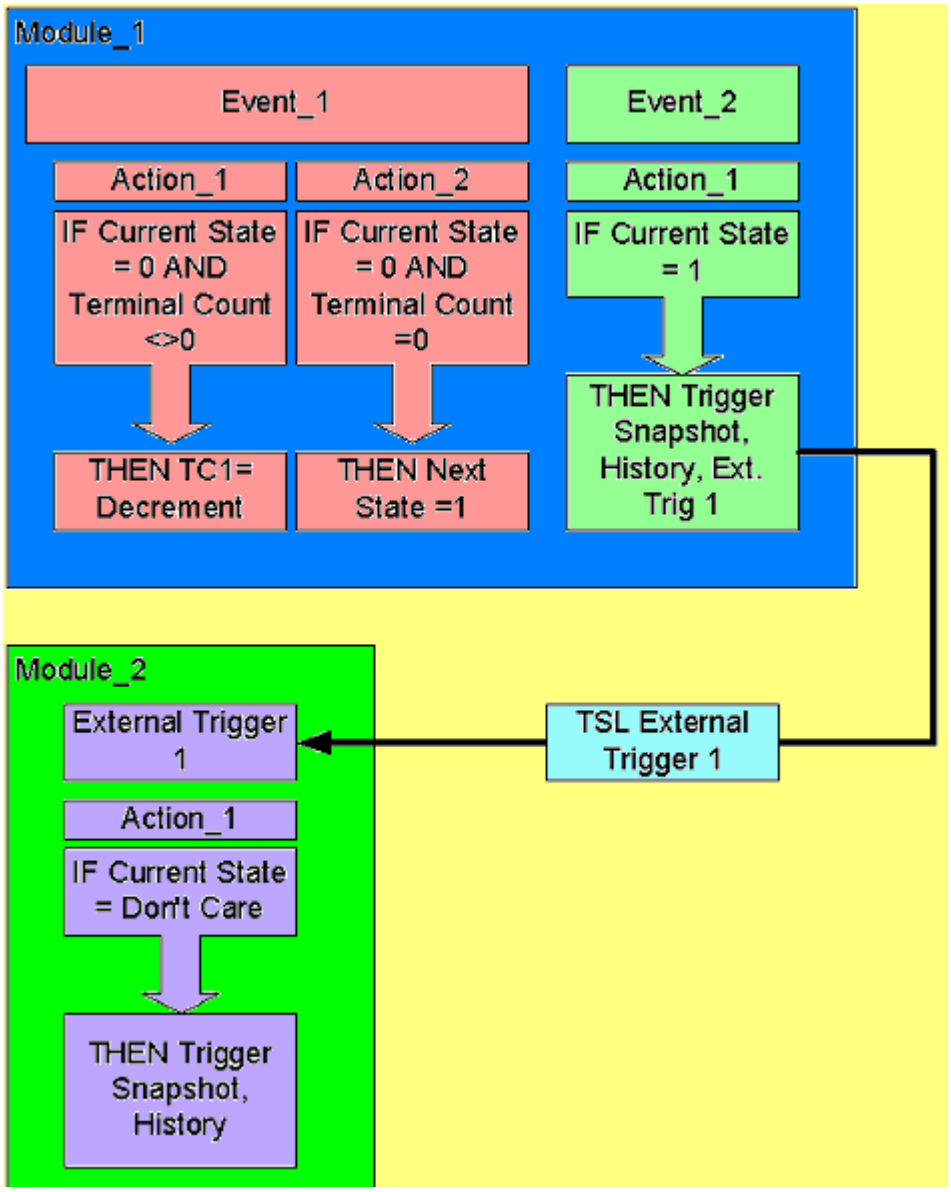
3.4.1 Actions Theory

The intention of the Actions List is top provide the user a means for fully qualifying the system condition before logging Events, effectively reducing the amount of data that the user will have to sort through during data analysis. There are two main areas that the Action List deals with:

- Conditions – Settings for specifying the active (current) State that the event is valid in, Timer/ Counter comparisons.
- Actions – Settings for what happens when the Condition(s) are met, such as transitioning to another State, decrementing a counter, Triggering the Monitor Trace, etc.

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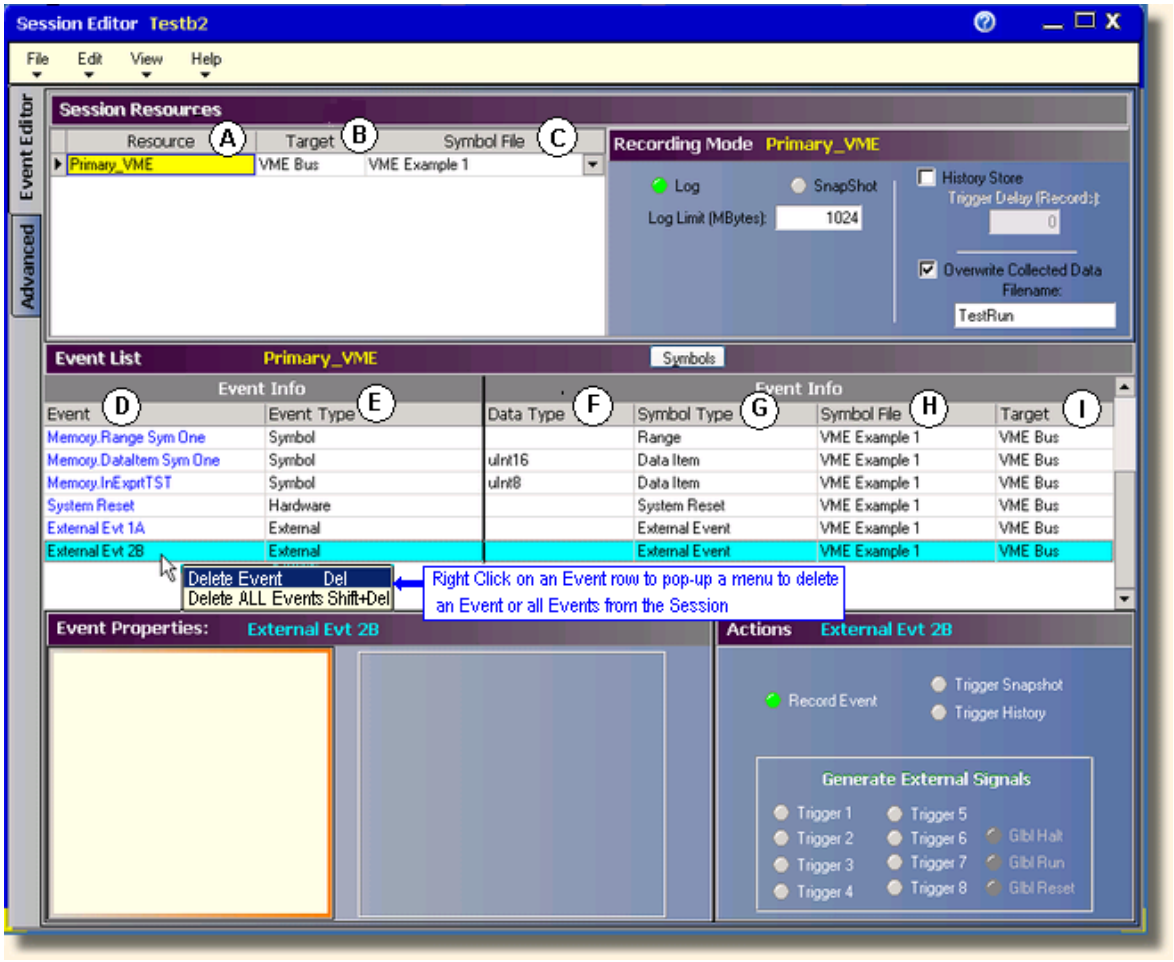
Action Diagram

3.4.2 Session Editor Event Editor Tab

The Session Editor permits specification of target Events that are to be recognized by the Monitor, and the specification of what will occur as a result of these Events. Basically, this is what defines the collection scenario.

The Session Resources pane lists all the Resource within the Session. The columns in this pane provides specifications of the Resource. Refer to the *Session Editor Window* figure below for the list that follows of column names and the information they contain.

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Session Editor Window

Note: the letters in parentheses correspond to the bubbles in the Session Editor Window figure.
(A) Resource-Name assigned to the Resource.

(B) Target-The part of your system the Resource is monitoring.

(C) Symbol Set-Name of the file containing user specified Symbol Events assigned to the Resource. Click under this column on the ▼ button to see the other available Symbol Sets.

The Event List pane lists the Events within the Session in rows and the specification of the Events in columns. The following lists the column names and the information they contain.

(D) Event-Name of the Event.

(E) Event Type-Indicates the Event in this row is a user defined Symbol type, or SystemTrace Hardware type or External type.

(F) Data Type- This column describes the nature of the data in Event (int16, float, etc.)

(G) Symbol Type-The Symbol used from the Symbol file to make the Event, e.g. Range, Data Item, External, etc.

(H) Symbol Set File-Name of the file used as a source of Events for this Session.

(I) Target-The part of your system where the Event is to occur.

The specification in the Event Editor pane determines what data will be collected, and what data will cause system triggers. Once data has been collected, the Analysis programs

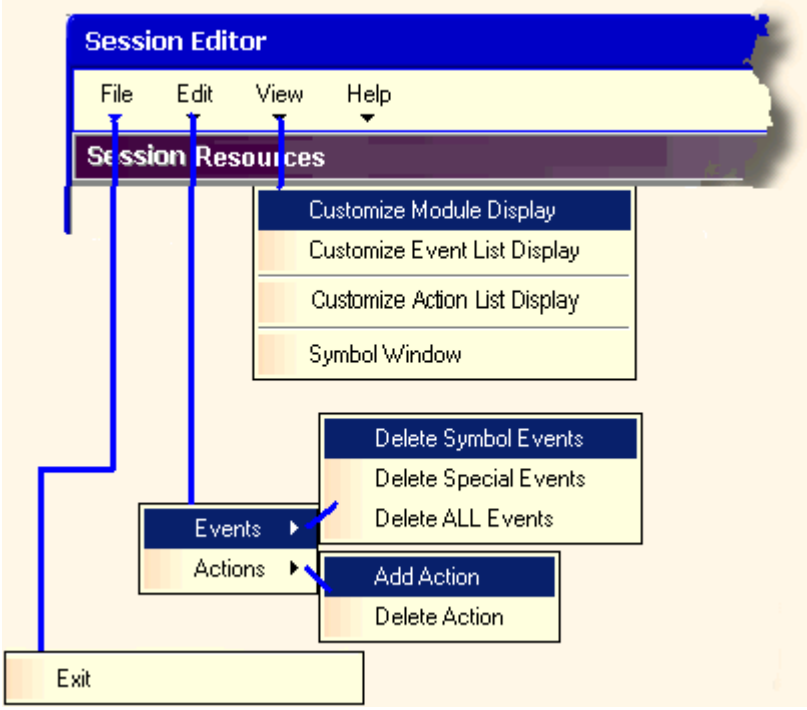
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provides multiple ways to view that data.
See the Analysis section for details on these features.
See the Resource chapter for details about Resource functions on your SystemTrace installation.

The section that follows will explain each menu items in the Session Editor Window. Some pains within the Session Editor window will be broken out and explained in the sections that follow.

3.4.2.1 Session Editor Menu Items

The Session Editor main menu provides access to all the areas that require input to formulate a monitoring Session, or edit an existing Session
This section will explain each of the menu items and sub-menu items shown in the figure *Session Editor Menu Items,* below.



Session Editor Menu Items

File

Exit
Closes the Session Editor Window.

Edit Events

Delete Symbol Events
Removes selected (highlighted) Symbol from the Session only. An example of the Symbol event are the first two rows in the figure *Event Pane* below The Event will no longer be listed

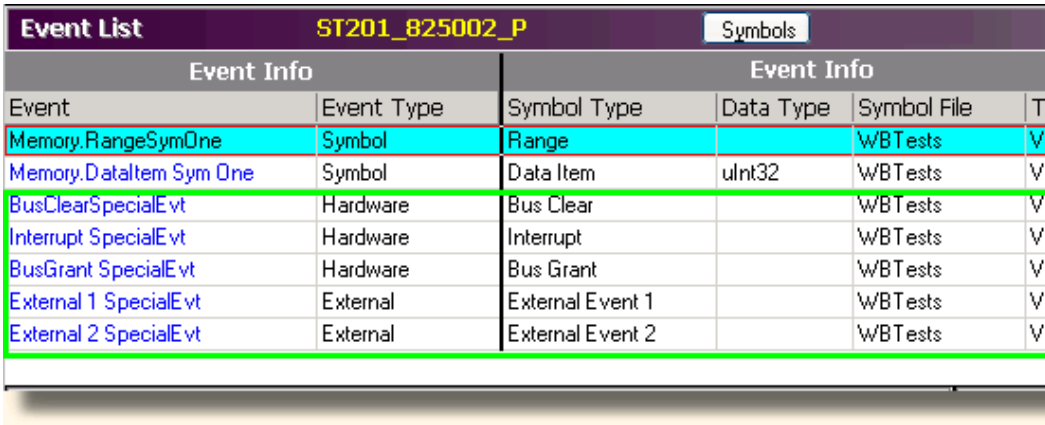
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in the Session Editor's Event pane. The Symbol is retained in the Symbol Set.

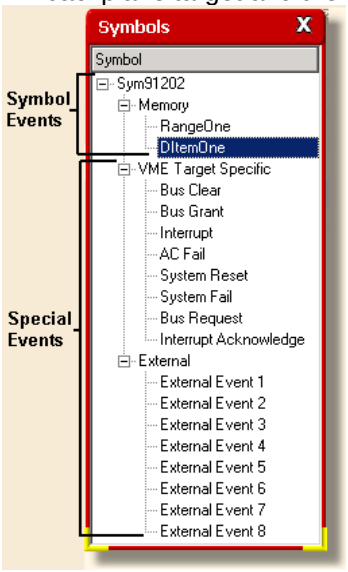
Delete Special Events
Removes all SystemTrace predefined Events from the Session. Examples of the Special Events are those shown in the enclosed border (last five rows) in the *Event Pane* figure below. The Special Events will no longer be listed in the Session Editor's Event pane.

Delete ALL Events
Clears the Session of all Events. All the Symbol Events and Special Events are still available from the Symbol Set and Special Events dialog



Event pane

The figure *Symbol Window* shows a list of Symbols and indicates which are Symbol types and those that are classed as Special Events. This example *Symbol Window* contains Special Events for a VME backplane target and the standard External Event.



Symbol Window

Actions
This selection presents the sub-menus explained below which remain grayed out until the Advanced

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tab is clicked.

Add Action
Add action will be grayed out untell the Advanced Session Editor window is activated, upon which its activation will open a dialog window to specify and add Action to the selected Event. See the Advanced Session Edits section for details.

Delete Action
Delete Action will be grayed out until the Advanced Session Editor window is activated (Advanced tab clicked) and there is more than one Action associated with the selected Event. All Events automatically have one Action associated with them that can not be deleted, only edited. See the Advanced Session Edits section for details.

View

Customize Resource Display
Allows arrangement of the column just as described in the "Resources Pane" section.

Customize Event List Display
Same as above

Customize Action List Display
Allows arrangement of the column just as described in the "Resources Pane" section.

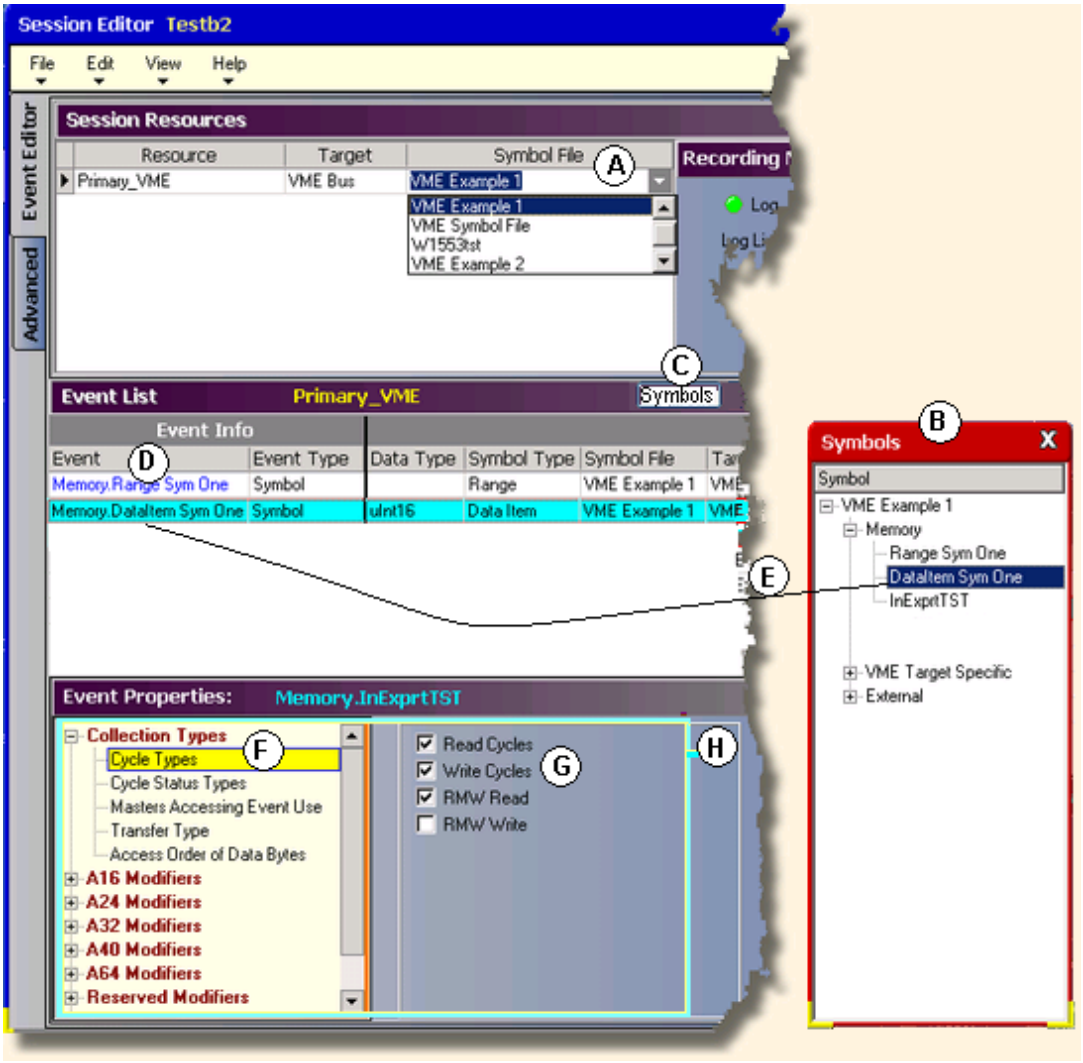
Symbol Window
Display the Symbol Window shown above.

3.4.2.1.1 Select Symbol File

After gaining an understanding of the Session and Symbol Editors from the previous sections, the Session established in the "How To Create a Session" can be completed. A Symbol Set must be selected and associated with the Session, and Symbols selected from the Symbol Set for Session Events, and details of the Events defined. Refer the figure *Session and Symbol Windows* and its letter bubbles for the "What To Do" sections that follow.

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Session and Symbol Windows

What To Do

Note: *All letter in parentheses refer to the figure Session and Symbol Windows only.*
Click on the ▼ under the "Symbol Set" column (A) and select a Symbol Set from the drop-down list.
If the list is empty, see the Symbol Editor chapter to create a Symbol Set.
Click on the "Symbols" button (C) to open the Symbol window (B) that displays the contents of the Symbol Set.

Why

This associates a Symbol Set with the Session and provides a source of Symbol Events to select.
Opening the Symbol window allow you to view the Symbol in the file and select them for Events.

3.4.2.1.2 Select Symbols for Events

What To Do

Note: *All letters in parentheses refer to the figure Session and Symbol Windows only in the preceding section.*
Select a Symbol from Symbol window (B) and drag it as shown (E) to the Event column (D)
With the Event still highlighted in the Event column, you may wish to further define it characteristics.

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In lower portion (enclosed in a box) of the Session Editor (H). View the Events Properties pane and click on the desired item's + box to expand it, shown at (F).
In the right portion of the Edit Events pane a selection of relevant option are displayed (G), select the items that add the necessary detail to your Event. For example, "Read Cycle", to only capture this Event on a Read, but not on a Write Cycle.

Repeat the procedure in the two section above to add Events to the Session.

Why
The preceding procedures are how you tell SystemTrace what to look for and capture or react to while the target runs. The Edit Events dialog put a finer point on the Event Symbol. So, if the exact conditions are know about an event on the target they can be defined as an Event with specific attributes SystemTrace will capture.

Other Options

Multiple Symbols can be selected from the Symbols window (B) by holding down the shift key and clicking the first and last Symbol selections and dragging them as a group into the Event pane (D). If the desired Symbols are not successive hold the Ctrl key down and select (click to highlight) each of the desired Symbols and drag them as a group into the Event pane.

Special Events specific to your target may be available. The example shown in section "Session Editor Menu Items" figure *Symbol Window* are for a VME bus. These Special Event items may be dragged from the Symbol window into the Event column as described in "What To Do" above, but Special Event items require that you compose a name for the Event that will be present in the Event column. A dialog box will prompt you for a name. This Name must be less than 128 characters long.

External Events are available on all SystemTrace units and are hardware inputs that SystemTrace can respond to just as any of the other Events already discussed. These External Events are selected and named in the same manner as Special Events.

The deletion of Both Special Events and External Events are described in "Session Editor Menu Items" section, "Delete Special Events".

Information about the hardware signals can be found in the Specification and Installation chapters.

3.4.2.2 Module Collection Modes

SystemTrace supports three modes of data collection: Log, Snapshot, and History. Log Mode stores records to a mass storage disk and is suitable for long term monitoring. Snapshot Mode stores data in a circular buffer, which may be triggered to stop filling upon the occurrence of a user-specified Event. History Mode works like Snapshot mode, with the exception that it collects unfiltered data. Log and Snapshot are exclusive of one another. History Mode may be used in conjunction with Log or Snapshot Modes. All modes require the user to compose a file name for the collected data. This file name may be retained or changed when the data is uploaded to the workstation. Two display-only modes are also available, RunTime Data and Statistics, which will be covered later.

What To Do
If the Session Editor is open, close it, unless the Resource you wish to configure is already listed under the Session Editor's Resources column, is so, go to the next section.
From the Control Console window Sessions pane, click on the desired Resource within the Session under the Name column. Your selection will be highlighted.
Right Click within the Session pane or click Setup on the Control Console menu bar. Select "Session Editor" from the drop-down/pop-up menu.

The Session Editor window will open with the selected Resource name in the Resources column at the upper left of the window (A) in figure *Session Editor Window* in section "Session Editor Event

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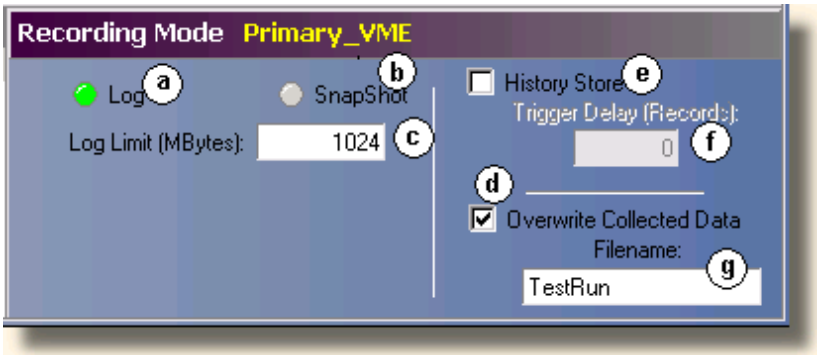
Editor Tab".

Why
The Resource(s) that appear in the Session Editor's Resources column represents one of the Sessions listed in the Control Console Sessions pane. To get access to a Resource that is not in the current Session Editor, the Session Editor window must be closed and the desired Resource selected from the Control Console Sessions pane and its Session Editor opened.

Follow the procedures in the following section for the collection mode desired.

3.4.2.2.1 Log Mode

When running in Log mode the Resource stores qualified records to mass storage until either a Log Limit is reached or the Monitor run is stopped. Refer to the figure *Session Editor Recording Pane (Log Mode)* below for the following procedures.



Session Editor Recording Pane (Log Mode)

What To Do
SystemTrace Data Collection Mode Defaults to Snapshot data collection mode.
If data Log Mode is needed for a long-term Monitoring run, click on the LED next to "Log Mode" shown in the figure above *(a).*
Accept the default Log Limit of 1024KB (enter nothing in the box).
Enter a file name for the logged data shown in the above figure *(g)*.

Why
Log Mode is used when a large amounts of data needs to be collected. One example would be, a random error occurs over several completions of the target's program cycle. Log Mode would collect enough data over a long period of time to increase the probability of capturing the error.

Other Options
A "Log Limit" in megabytes can be set to limit the amount of data recorded during a Monitor run. The Log Limit dialog box is shown in the figure *Session Editor Recording Pane (Log Mode) (c).*

Specifications

Maximum mass storage:	100M records.
Maximum rate of storage:	Resource will store 500,000 records per second to the disk without data loss. When this rate is exceeded the Resource inserts data overrun records into the Log File where was lost.

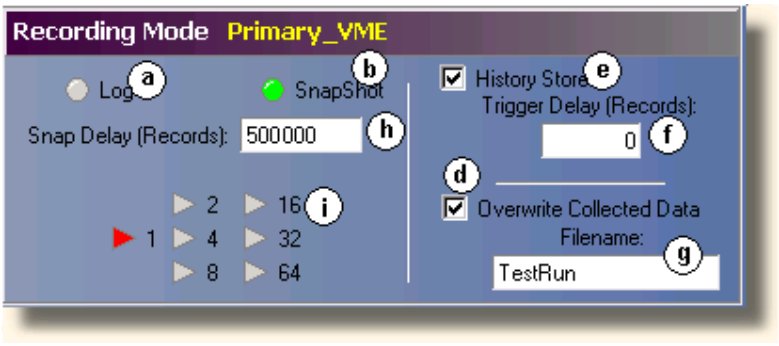
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3.4.2.2.2 Snapshot

Snapshot mode of data collection is configurable to support one, two, four, or eight Snapshot (trace) buffers. The Probes stores records into one Snapshot buffer until stopped by an Event Action setting. It then stores records into the next Snapshot buffer. If no Event Action setting stops recording in the first Snapshot buffer, then only the first Snapshot buffer shall contain valid records.
When the Probe detects a hardware event that meets the criteria of an Event specification that includes a Snapshot Trigger, the Probe store a number of records equal to a post-trigger record count ("Snap Delay") into the current Snapshot buffer. The Probe then freezes the contents of that Snapshot buffer, and begins recording into the next Snapshot buffer (unless the current Snapshot buffer is the last or only Snapshot buffer). The post-trigger record count applies to all Snapshot buffers. While the Probe is collecting the post-Trigger records, the Probe will ignore new Snapshot Trigger Events.
Both Log and Snapshot modes perform filtering defined in the Event Editor before storing records. See "Session Editor Event Editor Tab" section and sub-sections for further instructions concerning the specification of SystemTrace Events.

Refer to figure *Session Editor Recording Pane (Snapshot Mode)* below for the following procedures.



Session Editor Recording Pane (Snapshot Mode)

What To Do
To select Snapshot Mode, click on the LED next to "Snapshot" *(b)*.

Enter 500000 in the Delay dialog box (h).

Click on "Always overwrite previously collected data" (d).

If prompted, Enter a name for the file which will hold the collected data (g).

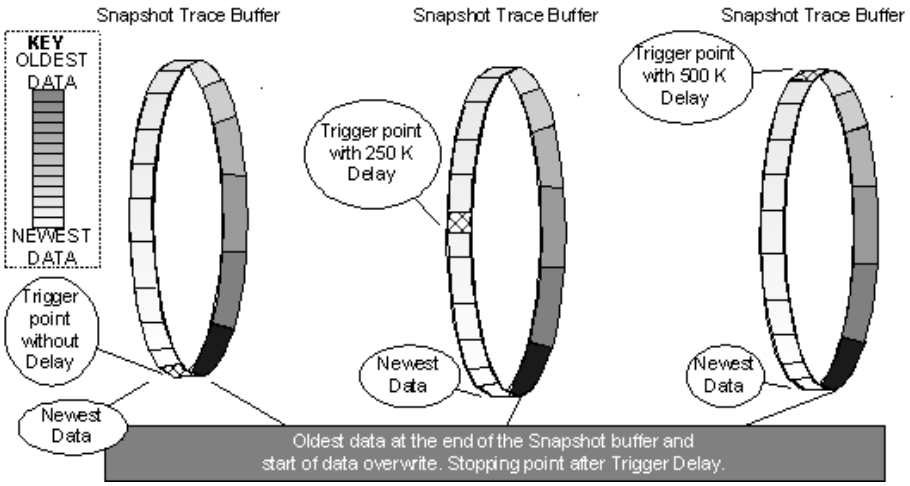
Why
Snapshot Mode is used to collect smaller amounts of data for short periods of time with more control over how the data is collected such as stopping data collection when an Event occurs.

A "Snapshot Delay" (Figure Session Editor Recording Pane (h)) of 500,000 was set to position the Snapshot Trigger in the middle of the trace buffer. The value is one half the maximum capacity of the single buffer. SystemTrace uses this value to initialize a counter before the Monitor starts. While the Monitor runs, before encountering a trigger condition, it does not use the Snapshot delay. It places qualified records into the trace buffer. If the buffer is full, then the new records are added by replacing the oldest one. However, after a trigger, SystemTrace checks the counter before recording each new event. If the counter is not zero, then the Event is recorded, overwriting the oldest record in the trace buffer, and decrements the counter. If a new Event is encountered while the counter is zero, the Event is not recorded. Hence, if SystemTrace runs long enough to decrement the counter to zero, the Snapshot delay represents

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the number of records in the trace buffer after the Trigger. In this case, the number of records before the trigger is 1MB minus the Snapshot delay or 500KB placing the Trigger point in the center of the data within the Snapshot buffer. Figure *Snapshot Trigger Delay* shows three examples of a Snapshot buffer, one with no Delay, one with a 250K Delay and one with a 500K Delay.



Snapshot Trigger Delay

Checking the "Overwrite Collected Data" (Figure *Session Editor Recording Pane (Snapshot Mode)(d)*) box can conserve memory space on the Resource when rerunning tests in which the previous results is not considered to be worth keeping. If the overwrite box is not checked you will be prompted for a file name before starting the Monitor.

Other Options

A "Snapshot Delay" (Figure *Session Editor Recording Pane (Snapshot Mode (h)*) can be set to position the Snapshot Trigger Event anywhere within the Snapshot buffer. Enter a value between one and the maximum capacity of the buffer. SystemTrace uses this value to initialize a counter before the Monitor starts. While the Monitor runs, before encountering a trigger condition, it does not use the Snapshot Delay. It places qualified records into the Snapshot buffer overwriting old data if any.

In Snapshot Mode the user can select any number of Snapshot buffers 1, 2, 4, 8, 16, 32, or 64 (Figure *Session Editor Recording Pane (Snapshot Mode)*(I)).

When available, Un-checking the "Overwrite Collected Data" will require the user to store Monitor results in new files to preserve the results of previous Monitor runs. The user will be prompted for a file name before starting the Monitor.

The History buffer option could be selected, which is explained in the next section.

Specifications

Maximum Snapshot buffer size: One Million Records / Number of Snapshots Selected.

The Probe is capable of storing records into consecutive Snapshot trace buffers with no data loss.

Capable of triggering a Snapshot as a result of an Event Action from the first Event eligible to be recorded.

Snapshot buffers may be uploaded as a whole unit to a file that contains markers to separate

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data from different Snapshot buffers.

3.4.2.2.3 History

If the "Save History Trace Buffer" (Figure *Session Editor Recording Pane (e)*)is checked, when the Monitor is started, the Resource begins storing records in the history store describing all events. As the Monitor session runs, the Resource continually stores records in the History Store until the Monitor session is stopped or an Event Action setting stops the recording.
When the Resource is configured to stop the History Store as a result of an Event Action setting the configuration is defined by two items: the Event specification and a post-trigger record count. When the Resource detects the event that meets the criteria of the Event specification, and it includes a History Store trigger, the Resource continues to store the number of records equal to the post-trigger record count into the History Store. Then the History Store freezes until the Resource is stopped and started again.
The "History Delay" parameter (Figure *Session Editor Recording Pane (f)*) is capable of taking any value from zero to the size of the History Store and has the same functional behavior as the Snap Delay, except its effect is on the History Store buffer.
The data collected by the History Store is saved in a file on the Probe with the same name as the Trace file (Figure*Session Editor Recording Pane (g)*). Only the file name extension distinguishes a trace file form a History file.

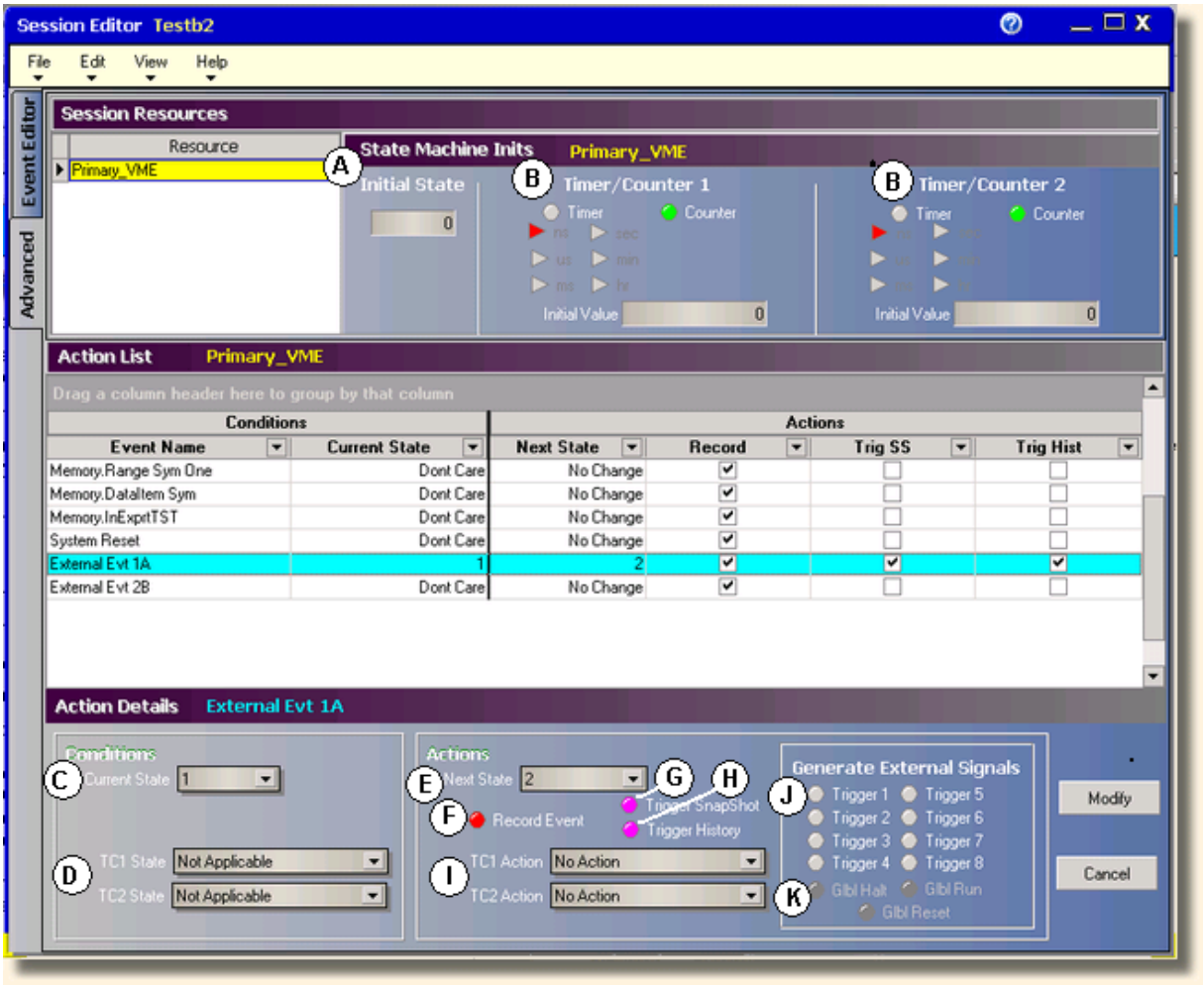
3.4.3 Session Editor Advanced Tab

The Session Editor Advanced Tab is the dialog window for Setting the Initial State (e.g. 0) of the State Machine, selecting Event Timers and/or Counters and setting parameters for their behavior. Also in this window, Setting Actions System Trace will take when the targeted Event occurs. The Action List pane provides a list of all the Events and their associated Actions with them in the current Session.

SystemTrace uses Condition/ Action scenarios in order to qualify events. By default, all Events are configured to be recorded regardless of any State, Timer, or Counter values. The user can configure the Events to record, cause triggers for Snapshot, History, and External Triggers to other Modules using the Action List. There are 64 States available as well as two configurable timer/ counters.

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Session Editor Advanced Window

When you add an Event to the Event pane, SystemTrace defines a default Action for the Event. This Action is set automatically to only Record the Event. Use the Action dialog to modify these predefined Actions or add new Actions. Right click within the Action List pane and select Add Action in the pop-up menu to open the Action dialog window.

When an event occurs on the target that is defined in the Session Editor Event pane, SystemTrace will respond (record, count, halt, etc...) according to user selected Action options. The Action Details pane is where existing Actions associated with the Event selected and highlighted in the Action List pane may be modified; click the Modify button to set changes.

An explanation of the specific Actions are in the following section.

3.4.3.1 State Machine Initial Values

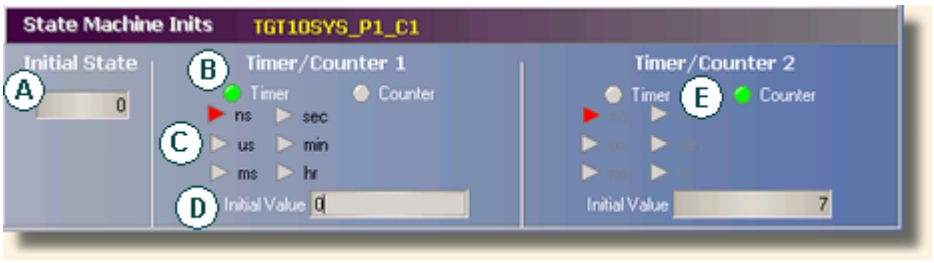
In order to operate, the State Machine must have initial values defined. This is where the user enters the initial state that the test will begin in, as well as configure the programmable timer/ counters for resolution and presets.

3.4.3.1.1 Intial State

The figure below *Timer Counter Pane* is the dialog pane within the Session Editor Advanced Tab where the Initial State of the State Machine is set. The Resource always operates in a

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state in which its reaction to Events are prescribed by default or the user. Each State is represented by a number (0-63) at the time the user set the Actions for the State. The State the Resource is in when target Monitoring begins is selectable by entering its representative number in the dialog box shown in the figure *at (A).*



Timer Counter pane

What To Do

The Initial State may be left at default. If other States are available (defined by a user) enter their number in the dialog box in the State Machine window.

Why

Resource States allows a different set of Actions to take place for different Event. Actions can be directed to changes the Resource's State and the Action in the Next State can direct the Resource to change States again creating a chain of States with defined Actions. In the State Machine dialog the Resource is directed where to start in this chain.

Other Options

There are no other option to select in this window, however, there are many options concerning States and Actions. See the Session Editor section and it sub-sections in this users guide.

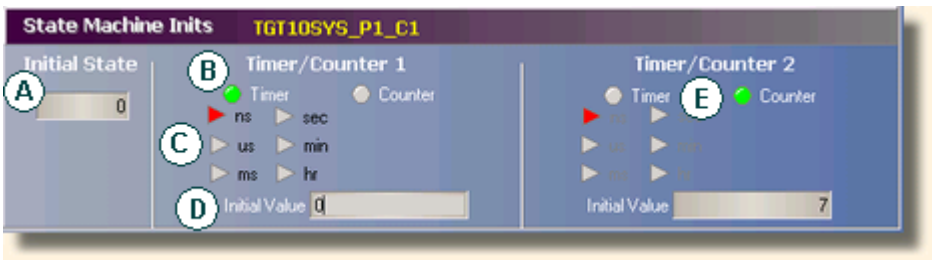
Specifications

Maximum number of States 64 per Resource (0-63)

3.4.3.1.2 Timer/Counter Setup

The Counter is used to detect the n^{th} occurrence of an Event or counts between Events. The Timer is used to detect out-of-limits timing relationships between two Events. SystemTrace supplies two configurable Timer/Counter resources for each Resource. Each acts as either a Timer or a Counter during a Monitor run. The Monitor is configurable such that it uses two Timers, two Counters, or one Timer and one Counter. Timer/Counters are not display features, they are enablers of certain Event Actions. Timer/Counters influence such Actions as State Transitions, Snapshot triggers, and External Actions.

SystemTrace supplies two configurable Timer/Counter resources (B) and (E) in the figure *Timer Counter Pane* below for each Resource. Each acts as either a Timer or a Counter during a Monitor run. The Monitor is configurable such that it uses two Timers, two Counters, or one Timer and one Counter. In this dialog pane the user selects Counter or Timer along with time resolution (C) and initial value (D).



Timer Counter Pane

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What To Do
The Timer/Counters may be left at default. If a Timer function is needed for example, click on the LED next to the word "Timer" on "Timer/Counter 1", click on the time resolution ms (milliseconds). Enter in the "Initial Value" box 500. (other parameters need to be setup in Action dialogs see Action).

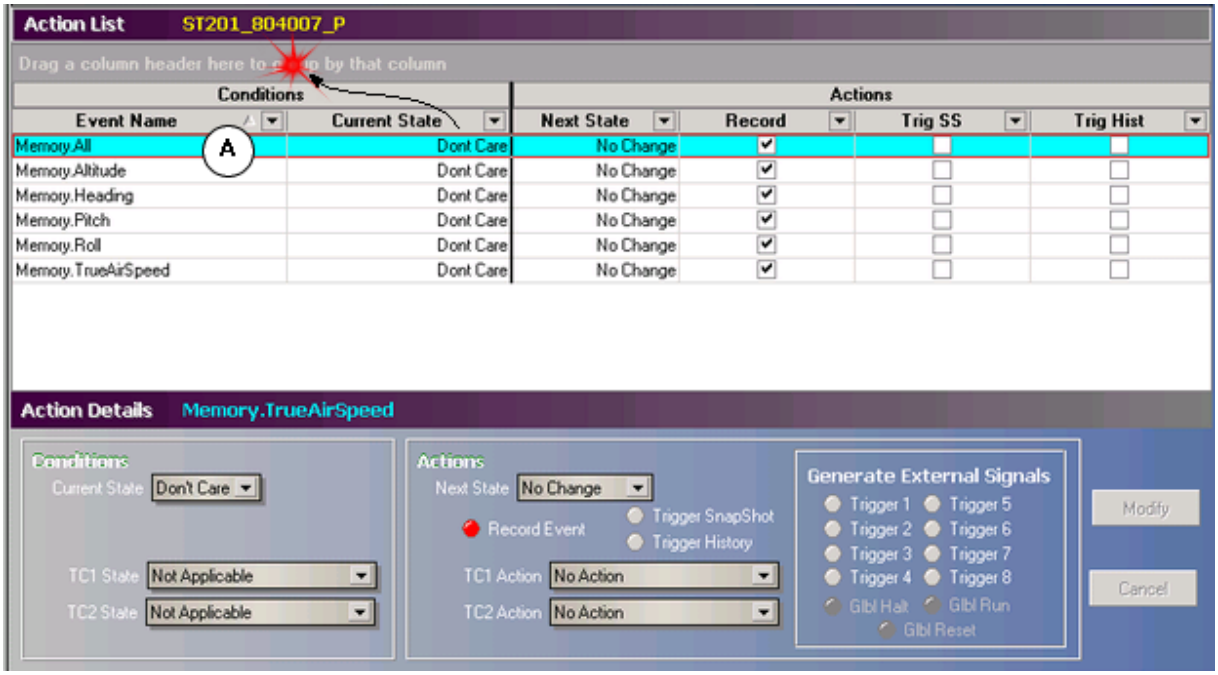
Why
The Timer is used to detect out-of-limits timing relationships between two Event. An Initial Value other than zero is entered to count down time or events in the case of a Counter. The Counter is used to detect the n^{th} occurrence of an Event or counts between Events.

Other Options
Both Timer/Counter 1 and 2 could be setup as Timer with different Initial Values, but, the time resolution must be the same for both. Both could be Counters with different Initial Values. Initial Value can be set to zero to count up time or events. The remaining options must be setup in Action dialogs, see Action.

Specifications
Timer/Counters are not display features, they are enablers of certain Event Actions. Timer/Counters influence such Actions as State Transitions, Snapshot triggers, and External Actions.
See Action for more specifications.

3.4.3.2 Action List

The Action List provides a list of all default and user defined Event Actions. When first opened, the Action List will contain an Event Action for each item in the Event List. These "default" Actions may be modified and new Actions may be added.



Action List Window

What To Do
To modify an Event Action, select it from the Action list and change the properties in the Action Details screen. Click the Modify button to save the changes.

To Add an Event Action, right click in the Action List and select Add Action from the pop-up

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menu. Select the desired Event and then enter the paramters in the Add Action window. Each Event may have any number of Actions associated to it if the user wishes to have it active in multiple states.

Other Options
The Action List may be sorted by the user by dragging a column heading into the sort bar as shown in the figure above. It is possible to perform sorts in several layers this way.

Why
The Action List's Conditions and Actions are used to define the progression of the test and to qualify Events using comparisons other than address, data, and access types. Specifically, Actions allow the user to create a state machine and utilize timer/ counters to qualify Events for state change and Snapshot/ History Triggers.

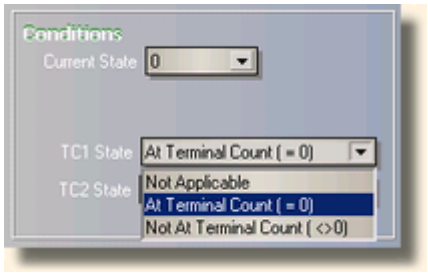
ERRATA
When an Event Action is Edited while a sort is active on the edited field, the Action selection highlighting ***(A)*** *may jump to the preceding item in the list, but will not actually have that item selected. The item that was edited will actually remain active in the Action Details window. This is a database anomaly and should have little to no effect on operation.*

3.4.3.2.1 Conditions

Conditions is a way to control SystemTrace's Actions based on how often an Event occurs (Counter) or when they occur (Timer) These Timer/Counters (TC1 and TC2) are set for the initial value during Resource configuration. The dialog shown in the figure *Action Dialog Conditions* below shows selections to specify at what point in the count the Action should be executed.

3.4.3.2.1.1 Current State

The Current State is the state number you wish to assign to the Event Action selected in the Action List. This State number is used to qualify what Actions are to occur on certain Events. When an Event is assigned to a Current State, the Actions defined in the Actions Dialog will occur when the Event occurs AND the defined state is active. States become active as the test progresses and Actions cause the State Number transitions from the Initial Value as specified in the Initial State dialog. Any number from 0-64 may be entered here. Enter " Don't Care" to have the Event active in all states. Any number of Events may be assigned to the same State.



Conditions Dialog

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3.4.3.2.1.2 T/C Conditions



Conditions Dialog

The selections in the menu in figure *Action Dialog Conditions* have the following effect.
Not Applicable
The specified Action takes place regardless of the Timer/Counter Value upon the Event occurrence. If a Timer/Counter dependent condition is not an Action associated with the selected Event, use "Not Applicable".

At terminal Count (0)
Execute the specified Action when Timer/Counter is equal to 0.

Not at terminal Count (<> 0)
Execute the specified Action when Timer/Counter is any value other than 0.

What To Do
Note: Before Timer/Counter Actions can be setup the Timer/Counters them selves must be configured. This is covered in the "Resource Configuration" section, a brief instruction example for Timer/Counter configuration follow.

To open the Timer/Counter configuration dialog, right click in the Session Editor window and select "Resource Configuration" from the pop-up menu then select the Timer/Counter tab from resulting "Resource" window. The Timer/Counters may be left at default. If a Timer function is needed for example, click on the LED next to the word "Timer" on "Timer/Counter 1", click on the time resolution ms (milliseconds). Enter in the "Initial Value" box 500.
Click the "Save & Exit" button at the bottom of the "Resource" window and continue in the Action dialog.

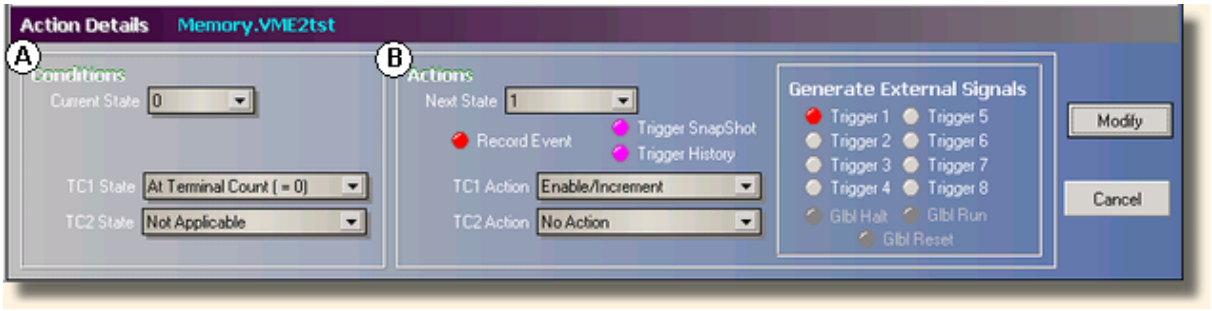
Click on "▼" in the TC1 State dialog box to select one of desired timer conditions.
Click on "▼" in the "Current State" dialog box and select a State number.

3.4.3.2.1.3 Timer/Counter Functions

Setup of the Timer/Counter Action is done in the "Conditions" and "Actions" portion of the Action Detail pane shown at (A) and (B) in figure *Action Detail Pane* below.

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Action Detail Pane

Note: Before Timer/Counter Actions can be setup the Timer/Counters them selves must be configured. This is covered in the "Resource Setup Timer/Counter" section.

The following section explain the details of Time/Counter (T/C) setup.

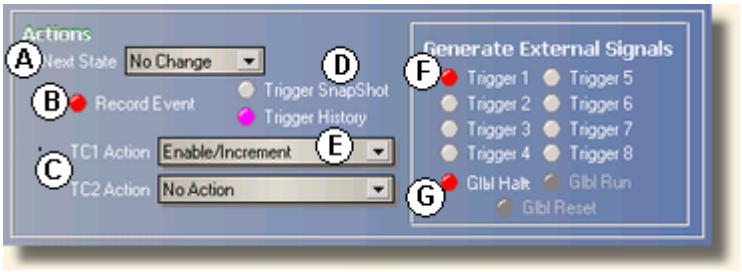
3.4.3.2.2 Actions

When you add an Event to the Event pane, SystemTrace defines a default Action for the Event. This Action is set automatically to only record the Event. Use the Action List to modify these predefined Actions or add new Actions

When an event occurs on the target that is defined in the Session Editor Event pane, SystemTrace will respond (record, count, halt, etc...) according to user selected Action options. The Action Details pane of the Session Editor window is the Action selection dialog. The specific Actions are explained in the following sections.

Note: The Action defaults are set to Record target activity (collect data). Upon initial setup (no setup file loaded) nothing needs to be done with Actions to do basic target monitoring.

The following sections will refer to the figure *Action Dialog* below.



Action Dialog

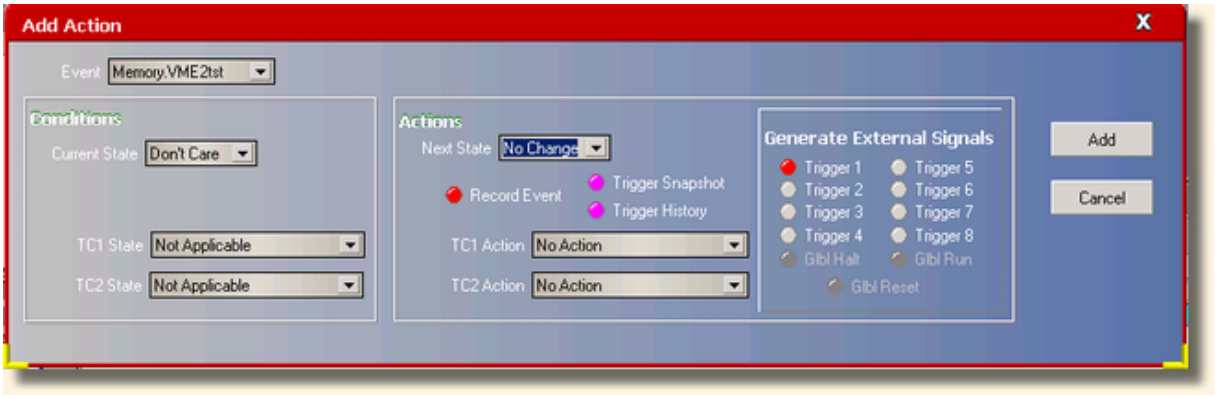
What To Do

Highlight an Event in the Action List pane of the Session Editor Advanced Tab.

Select "Edit" from the Session Editor's menu bar and "Action" | "Add Action" from the drop-down sub-menu. The Add Action Dialog window shown below opens. This window has all the same dialogs and LEDs as the Action Details pane within the Session Editor Advanced window and is only used when adding actions. The Action Detail pane is used for modifying existing Actions.

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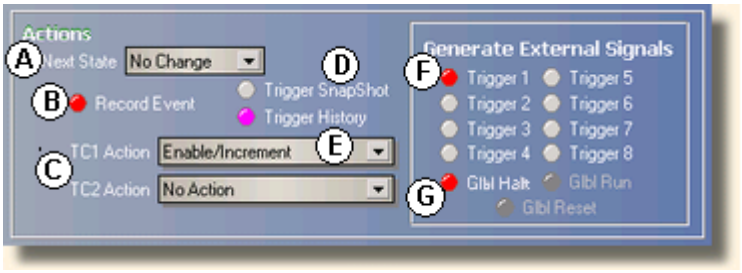


Add Action Dialog

The following sections will guide you through the Action options and setups for adding or modifying Actions.

3.4.3.2.2.1 Record

Record is a System Trace Action that is selected to create a record of the target's activities (collecting data).
Refer to figure *Action Dialog Pane below*



Action Dialog Pane

What To Do
Click on the LED next to "Record Event" in the Action pane of the Event Editor window to turn it ON (may already be ON), (B) in the figure above.

Why
This is how you tell SystemTrace to record the activity of the target (data flow).

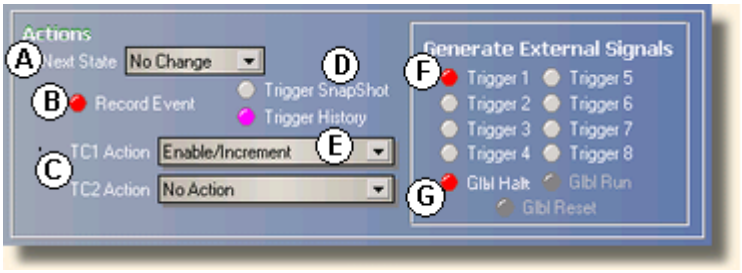
Other Options
The selection of Record is not required although it is the default. Record could be left Off (LED out) and some other Action could be used when the specified Event occurs, such as an External Trigger (explained latter). All the Action options available are explained in the following section. Note: If the Record action is turned off, then the Trigger Snapshot action is also turned off, if enabled, for the selected Event.

Specifications
Fast short-term storage RAM recording capacity: One million Events.
Long-term storage in twenty GB storage device: Eight hundred million Events

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3.4.3.2.2.2 Trigger

The Trigger Action controls the behavior of the Event Action. Selecting "Snapshot" initiates the Snaphot trigger which freezes the trace buffer using the delay set in the Snapshot Delay field and also selects the Record Event Action, if not already enabled for the selected Event. The "History" selection initiates the History record buffer in a similar manner as explained in History Mode. Snapshot and/ or History triggers may be set for any Event Action.



Action Dialog Pane

What To Do
Click on the LED next to "Trigger Snapshot" shown in figure *Action Dialog Pane (D).*

Why
Snapshot will record target activity until the occurrence of a specified Event (Trigger) and automatically stop Recording.

Other Options

"Snapshot Delay" could be setup to provide varying degrees of post and pre Trigger records.

"Log Mode" would provide longer term recording.

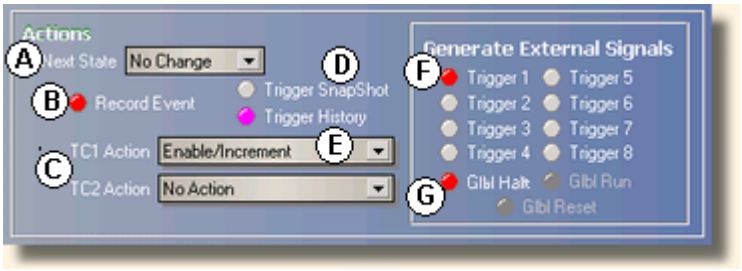
"History" could be selected to record all target activity independent of Event and Action Specifications.

Specifications

Snapshot buffer configuration:	One million Events, circular buffer.
History buffer configuration:	256K Events, circular buffer.

3.4.3.2.2.3 Next State

Next State is an Action selection to allow a subsequent Action (SystemTrace Event response) to execute after a previous set of selected Actions have already executed (change of state).



Action Dialog Pane

What To Do
A Next State Setting is not required. If a Next State is needed, click on the Nest State dialog box shown in figure *Action Dilog Pane (A)* and increment the number by one from the Current

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State value for each Next State Action setup.

Why
Next State is used to setup a chain of Actions each dependent on a previous Action. This makes it possible to control the circumstances in which an Action will be executed.

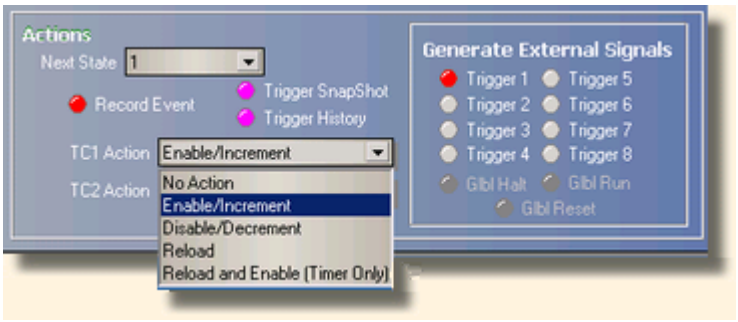
Other Options
All the items explained under Action are available for setup in each State.

Specifications
Maximum number of States: 64. (0 through 63)

```
Action Algorithm:
IF (an action or actions are defined in the action map for the
    event) THEN
   IF (SystemTrace's current state matches the current state in the action
       specification) THEN
     IF (record is selected) THEN
         IF (snapshot mode) THEN
            Store the event to memory.
         ELSE IF (log mode) THEN
            Store the event to disk.
     IF (breakpoint arm is selected) THEN
         Arm breakpoints.
     IF (timer/counter 1) AND (timer/counter 2)= Value in Action Spec.)
_     THEN
         IF (external signal is selected) THEN
            Assert the external signal.
         IF (trigger is specified) THEN
            Generate trigger.
         IF (next state is specified) THEN
            Switch to next state.
         ELSE
            Stay in present state.
Perform timer/counter actions.
```

3.4.3.2.2.4 T/C Action

This portion of the Action pane shown in the figure below, *Timer/Counter Action Dialog,* is where you specify what happens to the counter when the Conditions are met in the Conditions portion of the Action Detail Pane.



Timer/Counter Action Dialog

The selections shown in the menu of figure *Timer/Counter Action Dialog* have the following effect.

No Action
Counter not altered.

Enable/Increment
Increment the Counter.

Disable/Decrement

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Decrement the Counter.

Reload
Reload initial value specified in the Initial Value field of the Timer/Counter pane and retain present state.

Reload and Enable (Timer only)
Reload initial value specified in the Initial Value field of the Timer/Counter pane and change Timer state to Enabled.

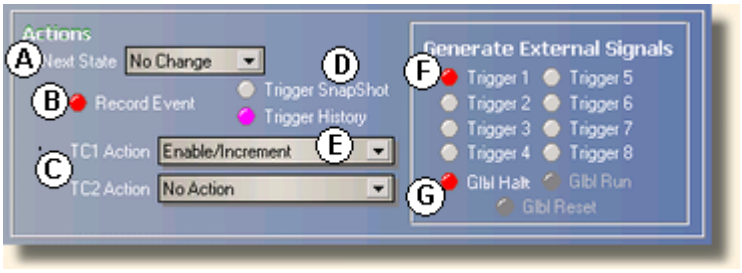
Select an Action for the current state of the timer/counter settings.

What To Do
Click on "▾" in the dialog box to select one of desired timer behavior.

Why
This is how you tell SystemTrace what the Timer/Counter should do at the start of the session when the Event specified occurs.

3.4.3.2.2.5 Generate External Trigger

Specify the External Signal function by clicking on the LED next to a Trigger selection shown in *Figure Action Dialog Pane (F).* **SystemTrace** can generate External Triggers (output) based on the occurrence of target Events or a received External Event. See the Installation chapter for physical information.



Action Dialog Pane

3.5 SystemTrace Software Instrumentation

3.5.1 STsi Introduction

This chapter covers System Trace Software Instrumentation (STsi) functions and features. STsi is a feature included in select backplane monitor Modules that supports logging of software events into the SystemTrace data stream. This is accomplished by mapping the SystemTrace backplane monitor into the backplane memory and instrumenting the user software to write values to these specific locations upon entry/ exit of procedures and when accessing local variables. When the software encounters these instrumentation points, causing a write to specific STsi memory locations, the SystemTrace™ monitor captures the transaction and logs it as an Event.

The STsi tools provide a method for configuring and tracing these Events utilizing special features in the Symbol Editor and Session Editor. The Symbol Editor features allow the user to build a special section in the symbol set to specify the procedures and data (variables) that the user may choose from when instrumenting software. The Symbol file also includes the settings for STsi memory is mapping and how the processor relates its local memory address to get to the STsi memory. Once the Symbol set is complete, the user exports the Symbol list to a C include file that defines the procedures and data items as pointers to backplane memory locations using the appropriate data types.

The Session Editor features for STsi include a special STsi tab in the GUI that displays the current

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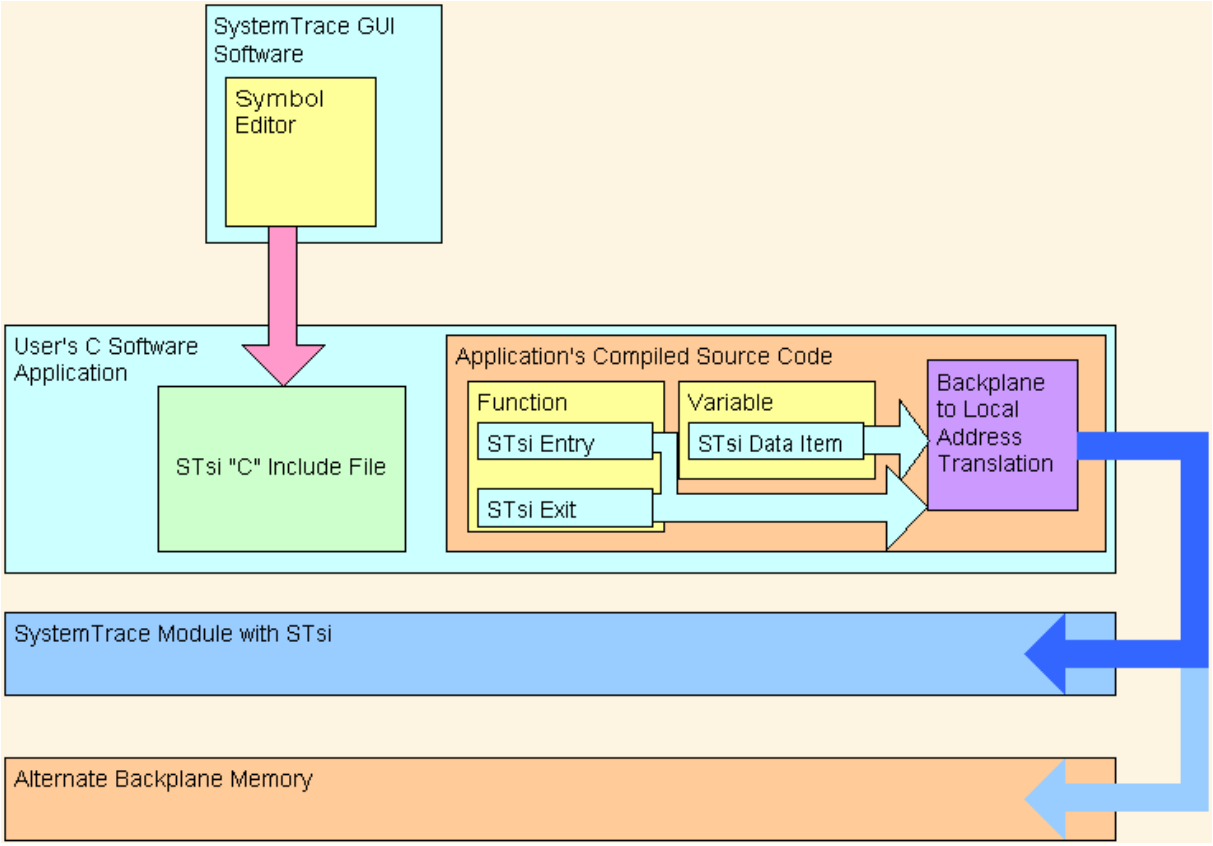
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settings (loaded when a Symbol set is selected) and provides buttons to Initialize (enable) or disable STsi memory on the backplane.

The STsi provide support for exporting the required files for the C programming language. It is possible to write wrappers or user generated support for alternate programming languages, such as Ada.

Utilization of the features are demonstrated in the"**What To Do**" sections. Terms and words used in this manual that are related to SystemTrace attributes are capitalized to distinguish them from their generic uses.

3.5.2 STsi Overview



Block Diagram of STsi Operations

3.5.2.1 What You Need to Know

In order to use the STsi features, the user must have an STsi enabled product and:
1) Know the local to backplane memory address that will be used for each processor/ CPU board
2) Know where the STsi memory is to be mapped
3) Know how your compiler handles shorts and integers (8, 16, 32 bits, etc.)
4) Know the Data Transfer set for the processor(s) accessing the backplane bus (D16, D32, etc.)
5) Be prepared to compile the instrumented C code and be familiar with the C language for programming the instrumentation points

NOTE: It is possible to write wrappers or user generated support for alternate programming languages, such as Ada.

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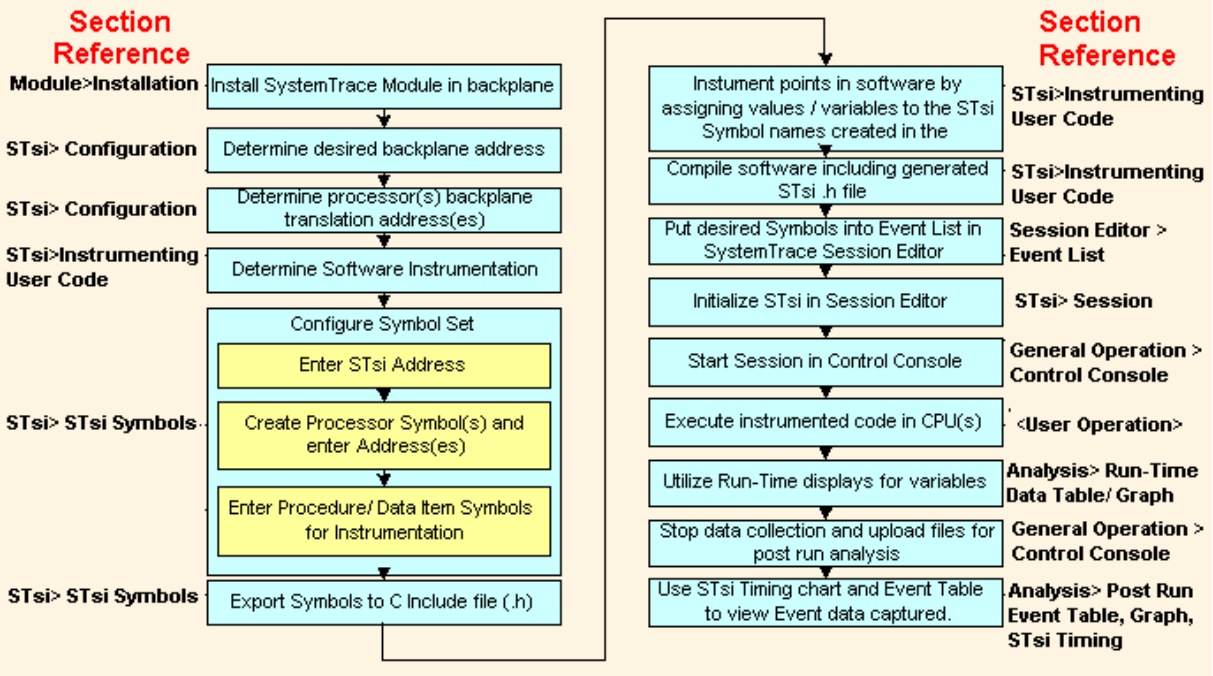
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3.5.2.2 STsi Components

The basic compents of the STsi operations include:
1) The SystemTrace User Interface Software (with STsi)
2) The C include file created from the SystemTrace Symbol Set
3) The C include file containing the TYPEDEFS for data types
4) One or more STsi capable Modules

3.5.2.3 STsi Flow

The basic procedures for using the STsi features are shown in the flowchart below.



STsi Flowchart

3.5.2.4 Configuration

Configuration of the STsi features may involve some research, or at least some help from someone very knowlegable about the memory utilization of the processor boards and backplane in use. This section will explain the configuration parameters and the general principles behind them.

3.5.2.4.1 STsi Memory

STsi memory is used to provide a 'dummy' memory location on the backplane for the instrumented software Events to be logged. This is not actually memory, but rather a responder to terminate processor generated write cycles. The base memory address for the STsi memory must be defined by the user. It is a critical setting as this is where the instrumented code will attempt to log events for STsi. It is also very critical that this address is exclusive of any other address in the backplane. Each type of backplane will also have attional settings. These settings are defined in each Module specific chapter of the user manual. It is important to remember that this may not be the exact address that the processor uses, rather the address on the **BACKPLANE**.

Specifications
STsi Memory Address: User Defined BACKPLANE memory location (see Module Specific Chapter)
STsi Memory Size: 8 Kbytes contiguous

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3.5.2.4.2 Processor Memory

A Processor is considered to be a unit of execution. This may be a CPU board or even a thread of execution among others in a single executable. The user may define as many processors as desired. However, each processor will utilize a different piece of memory in the STsi for logging Events. When Configuring Processor settings in the STsi, the user must obtain the Processor(s) LOCAL memory address that will be used to write to the STsi BACKPLANE memory address. In other words, the Processor Address is where the software writes to get to the STsi Address on the BACKLPANE.

3.5.2.4.3 Compiler Word Size

It is important to understand how your particular compiler handles data types. Some compilers assume an unsigned int is a 16 bit word, some assume it a 32 bit word. Some assume an unsigned short int to be an 8 bit, some a 16 bit word. In general, it depends if the compiler supports 32 bit processors, or if it assumes 16 bits. This is critical as the STsi feature will track Events based on the access types (see next section). For this reason, a file that sets 'typedefs' for data types used in the STsi include file is used. The user must modify this file appropriate to the compiler conditions that exist for them. See the following section **ITCNDEFS: Type Definitions**.

3.5.2.4.4 Data Transfer

Various backplanes transfer data in various sizes. Some backplanes transfer data in different sizes (8 bit, 16 bit, 32 bit, etc.) at different times. Typically, when writing data to a particular address, the data size will be consistent. You must know what word size will be used. This is how the STsi will understand how many cycles to capture for multi-transfer data Events.

Example: A floating point variable (32 bits) is instrumented in the user software. The processor / circuit board is only capable of writing in 16 bit transfers. Thus, it will take two 16 bit transfers to write the Event to the STsi memory.

When entering Symbols, the user must select the transfer size in the Symbol Editor. See Module specific chapter(s) for details.

3.5.2.4.5 ITCNDEFS: Type Definitions

The installation of the SystemTrace User Interface Software includes a file named ITCNDEFS.h. This file may be found in the installation directory of SystemTrace under .\bin. Typically this is "C:\Program Files\ITCN\SystemTrace\bin". Below is the default ITCNDEFS.h file. The user must modify the typedefs (if required) to match the compiler word sizing. For example: some 16 bit compilers may require the user to specify unsigned int as U16INT, because unsigned short int is an 8 bit word. Note the presence of the __int64 data type. Some compilers may not support 64 bit types and the entries may have to be removed for your file.

Edit this file and save it to your development directory

```
////////////////////////////////////Default  ITCNDEFS.H////////////////////////////////
#ifndef __itcndefs_H
#define __itcndefs_H

/************************************************************
 ITCN Host independent sizes
************************************************************/

typedef signed char         S8INT; //signed 8 bit
typedef unsigned char       U8INT;//unsigned 8 bit
typedef signed short int    S16INT;//signed 16 bit
```

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```
typedef unsigned short int   U16INT;//unsigned 16 bit
typedef signed long int      S32INT;//signed 32 bit
typedef unsigned long int    U32INT;//unsigned 32 bit
typedef          __int64     S64INT;//signed 64 bit
typedef unsigned __int64     US64INT;//unsigned 64 bit


#endif
```

3.5.2.4.6 STsi Include File

The STsi Header file is the include file created when the selected Symbol set is exported as a C include file. This file defines the user created Symbols as pointers to STsi memory locations. When the STsi Symbol section is populated, the user defines Procedures and Data Items which relate to Entry/ Exit points and variables in the user's software. Procedure items are always defined as type CHAR, this ensures a single transfer on the backplane bus. Data Items are defined as the type selected for the symbol, so that the data collected matches the data format in the user program. Labels are also defined in the SystemTrace™ Symbol Editor under the labels tab. These are simply DEFINES so that the user can easily indicate entry and exit points of the procedures, etc.

```
#ifndef __Stsi_2_H
#define __Stsi_2_H

/****** STsi "C" Include File ******/
#include "itcndefs.h"
/****** STSI BASE ADDRESS ******/
U32INT * const STsi       = 0xF14E0000;
/*************************************************************
STsi_Processor1 AND ITS SYMBOLS
*************************************************************/
U16INT * const STsi_Processor1  = 0xF14E0000; /* Processor */
U16INT * const STsi_Processor1_DrawObject        = 0xF14E0000; /* Procedure */
U32INT * const STsi_Processor1_DrawObject_Stair1          = 0xF14E0008; /* Data Item */
U32INT * const STsi_Processor1_DrawObject_Stair2          = 0xF14E0010; /* Data Item */
U32INT * const STsi_Processor1_DrawObject_Square         = 0xF14E0018; /* Data Item */
U16INT * const STsi_Processor1_InitShapes          = 0xF14E0020; /* Procedure */
U16INT * const STsi_Processor1_InitShapes_InitCount       = 0xF14E0028; /* Data Item */
U16INT * const STsi_Processor1_InitShapes_InitCount2      = 0xF14E0030; /* Data Item */
U16INT * const STsi_Processor1_Flag1     = 0xF14E0038; /* Data Item */
U16INT * const STsi_Processor1_Minor_Cycle_Count         = 0xF14E0040; /* Data Item */
S16INT * const STsi_Processor1_Major_Cycle_Count         = 0xF14E0048; /* Data Item */
U16INT * const STsi_Processor1_InitStair2          = 0xF14E0050; /* Procedure */
U16INT * const STsi_Processor1_WordPlay          = 0xF14E0058; /* Data Item */
U16INT * const STsi_Processor1_StairFunction      = 0xF14E0060; /* Procedure */
U16INT * const STsi_Processor1_SquareFunction   = 0xF14E0068; /* Procedure */
U16INT * const STsi_Processor1_WordPlayFunc    = 0xF14E0070; /* Procedure */
U16INT * const STsi_Processor1_Main_Program    = 0xF14E0078; /* Procedure */
/*************************************************************
LABEL DEFINITIONS
*************************************************************/
#define START 1
#define END             2
#define ENTRY           3
#define EXIT            4
```

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3.5.3 STsi Operation

The STsi features are integrated throughout the Graphical User Interface. This section of the user documentation will explain the operation of the STsi features within these software applications. Any operations that are a part of the standard operating procedures will reference the user to the appropriate chapters. The following is a list of operations that will be explained in detail in the remainder of this section.

1) Determine if you will use the available STsi memory or an alternate memory board for the software instrumetnation writes.
   a) If using STsi memory, determine the desired Backplane address for the STsi memory address.
   b) If using alternate memory board, determine the Backplane address for the base if the alternate memory board.
2) Determine the base address that your processor will write to to reach the backplane address of the STsi or the alternate memory board.
3) Determine if you wish to add the Session (test scenario) to the existing workspace, modify the current Session, or create a new Workspace.
   a) to add a Session to the existing Workspace, create a new session as described in CreatingSessions
   b) to modify the current Session, modify the Symbol Set for STsi as explained in Symbol Set and the Session as explained in STsi Session
   c) to create a new Workspace, refer to the General Operations: How to Create a Workspace. You will then create new Sessions and Symbol Sets as required in the Workspace.
4) Create or modify the Symbol Set as explained in the Symbol Editor Section or STsi: Symbol Set Section
   a) Enter the parameters for the STsi section as explained in STsi Symbol Section
   b) Create the desired number of processors as explained in STsi Processor Section
   c) Enter the desired Symbols under the appropriate processors as explained in STsi Procedure and STsi Data Item Sections
   d) When the Symbol Set is complete, export it to a C include file as explained in Exporting to C Include file Section
5) Instrument your source code and comipile with the STsi Include Files created from the Symbol Editor. Source code instumentation is explained in Instrumenting User Source Code Section.
6) Create or modify the desired Session (collection scenario). The Session must use a Symbol Set that contains STsi setup.
   a) In the Session Editor Event List, a Symbol Set with STsi symbols must be selected as explained in Session Editor Section
   b) Open the Symbols list and select the desired Symbols (both memory and STsi) into the Event List as explained in Session Editor Section
   c) Select the desired recording mode and triggers as explained in Session Editor Section
   d) Select Advanced settings in the Advanced tab as explained in Session Editor: Advanced Section
   e) Open the STsi tab in Session Editor as shown in STsi Session Section
   f) Verify that the STsi information is correct as shown in STsi Session
   g) Ensure the SystemTrace Module is powered on and ready
   h) Initialize the SystemTrace STsi, this will send the configuration saved in the Symbol Set as explained in STsi Session
7) In the SystemTrace Control Console, start the Session for data collection as explained in General Operation: How to Start a Session Section
8) Utilize the Run Time Table, Graph, and Statistics displays to provide a sampled on-screen display of the system data during execution as explained in Run-Time Data Analysis Section
9) Once the desired data collection is complete, stop the session and upload the data as explained in the General Operation: How to Stop a Session Section.
10) Utilize the Post Run Analysis tools to display the collected data
   a) STsi Timing - provides timing measurements of procedures as explained in

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STsi Timing Section

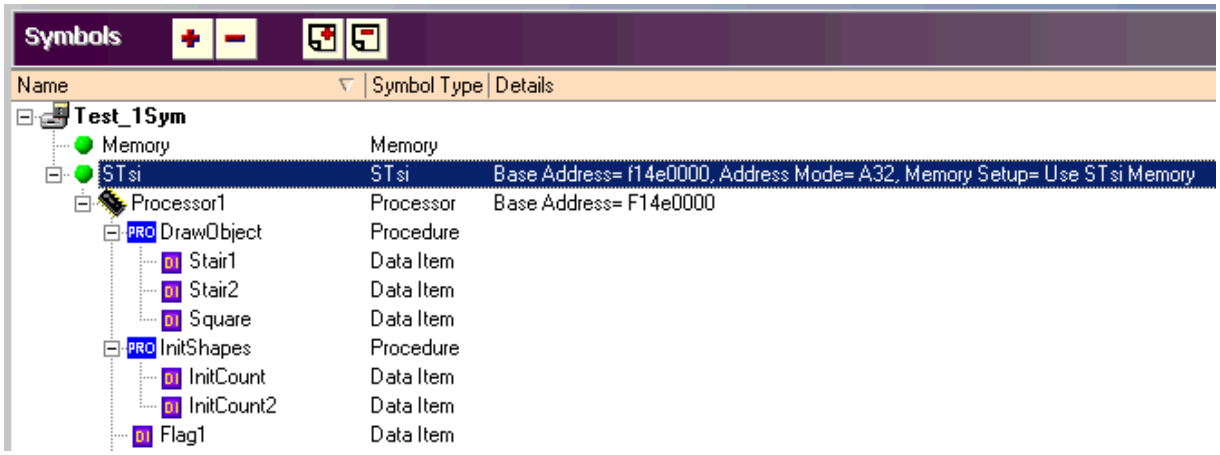
b) Event Table - provides a text table history of the data collection for all backplane and STsi Events collected as explained in Post Run Analysis

c) Event Graph - provides a X-Y plot of Data Item values along a time line for backplane transactions and STsi data as explained in Event Graph

d) Event Timing - provides timing measurements of backplane transactions as explained in Event Timing

3.5.3.1 Symbol Set

As explained in the General Operation and Symbol Editor sections, the Symbols Sets are user defined symbols relating to physical addresses on the backplane. The user may create any number of sets for different system configurations. These Symbols are used to create Event lists, or collection lists, for monitoring the system. The STsi features of the Symbol set include special features for defining processors and software elements for monitoring using the STsi backplane memory. Open the Symbol editor and select or create the desired Symbol Set as explained in OpeningSymbolEditor section.



SystemTrace Symbol Set with STsi

3.5.3.1.1 Configuring the STsi Symbol Section

Under each Symbol Set, there are multiple sections. These sections are present by default and may not be deleted. The STsi section will be present when a Module support the SystemTrace Software Instrumentation feature.

What To Do

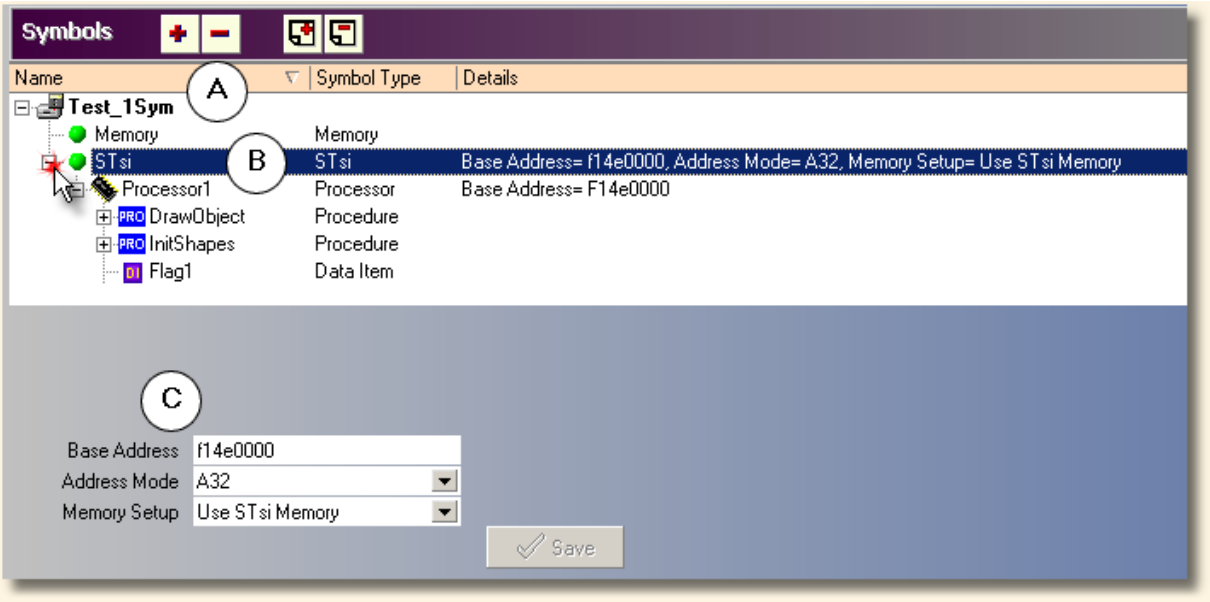
In the Symbol Editor, select the Symbol Set for edit by clicking on the Symbol Set name in the window **(A)**.

Select the STsi section **(B)**

Enter the appropriate information for the Base Address, Memory Setup and any target specific settings such as Address Mode for VME **(C)**.

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STsi Symbol Section

Why

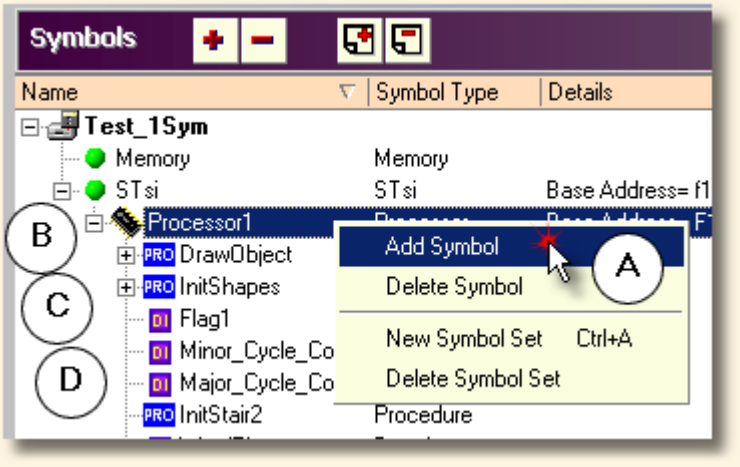
The STsi section is where the user will enter the settings for the STsi so that the Module will know if it is to use STsi internal memory or if the user's software will write the instrumentation events across the backplane to an alternate memory card. The Base Address field determines where the STsi memory will reside or specifies the backplane address of the alternate memory board.

3.5.3.1.2 STsi Symbols

Once the STsi section has been configured, the user will enter Symbols that are intended for software instrumentation.

What To Do

In the Symbol Editor, select the STsi section, then right click and select add Symbol **(A)**.
You then will select the type of symbol to be added. Available types are Processor, Procedure, and Data Item. The following sections explain each Symbol Type and its associated parameters.



Adding STsi Symbols

Why

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STsi symbols define the paramters for monitoring the Software Instrumentation calls that the user will insert in the source code. These Symbols are used for three purposes:

1) They configure the STsi memory
2) They are used in creation of the C include file for compiling instrumented code
3) They relate to BACKPLANE memory locations so that when the instrumented code accesses the locations, the SystemTrace will log the transaction.

Other Options

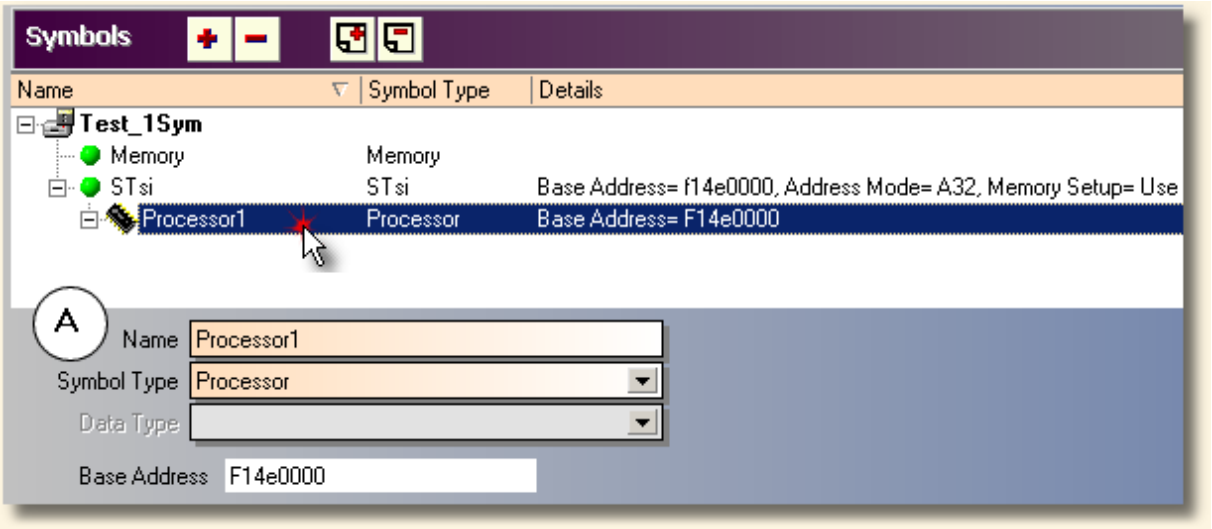
SCOPING - Symbols may be nested within one another. This is refered to as Symbol Scoping. Scoping allows the user to refernce Symbols to one another in a hierarchical fashion. It also allows multiple symbols to use the same name under different parents. To scope a Symbol, right click on the desired parent when creating the Symbol or click and drag it under the desired parent if the child symbol already exists.

3.5.3.1.2.1 STsi Processor

An STsi Processor symbol represents an executing entity. This entity may be a CPU board, or even a task or thread within an application. The user can define as many processors as desired in the Symbol Set. The user can even enter processors that are in different backplanes and the symbol set may be used in defining Event collection on multiple SystemTrace Modules.

What To Do

When the user selects "Add Symbol" under the STsi section, a new, blank Symbol will appear. The user must enter the Name and select the PROCESSOR symbol type. The Base Address is also entered. See the figure below at **(A)**.



STsi Processor Symbol

Why

STsi Processors define executing units in the user's system. Each processor will identify a base address that all symbols under it will be based upon. This address determines the base address of where the actual pointers for the STsi symbols in the instrumented code will access. The user may specify as many processors as desired. Each Processor Symbol consumes one STsi location. There are 1024 STsi locations available in the STsi memory.

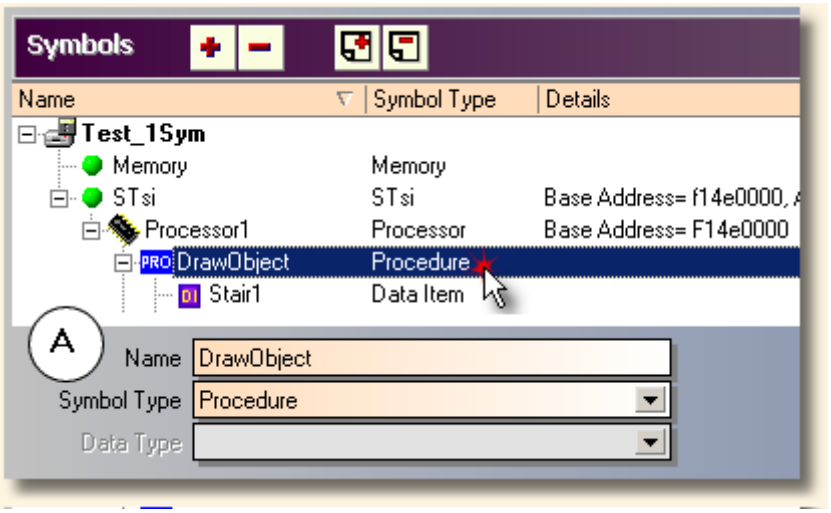
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3.5.3.1.2.2 STsi Procedure

An STsi Procedure Symbol represents an procedure, function, or module within the user's executing code. The user can define as many procedures as desired in the Symbol Set.

What To Do

When the user selects "Add Symbol" under the desired **Processor** or **parent Symbol**, a new, blank Symbol will appear. The user must enter the Name and select the Procedure Symbol Type. See the figure below at **(A)**.



STsi Procedure Symbol

Why

STsi Procedures are used to time stamp the instrumented Entry and Exit points in procedures, functions, modules, etc. in the user's software. The user will write a low value, such as zero or one, for the Entry and a higher value, such as two, for the Exit. STsi Procedure Symbols are exported in the C Include file as CHAR data types, since the the data passed is typically a single digit number. Events collected based on Procedure Symbols are available for review using Post Run anlysis tools STsi Timing and Event Table. Each Procedure Symbol consumes one STsi location. There are 1024 STsi locations available in the STsi memory.

3.5.3.1.2.3 STsi Data Item

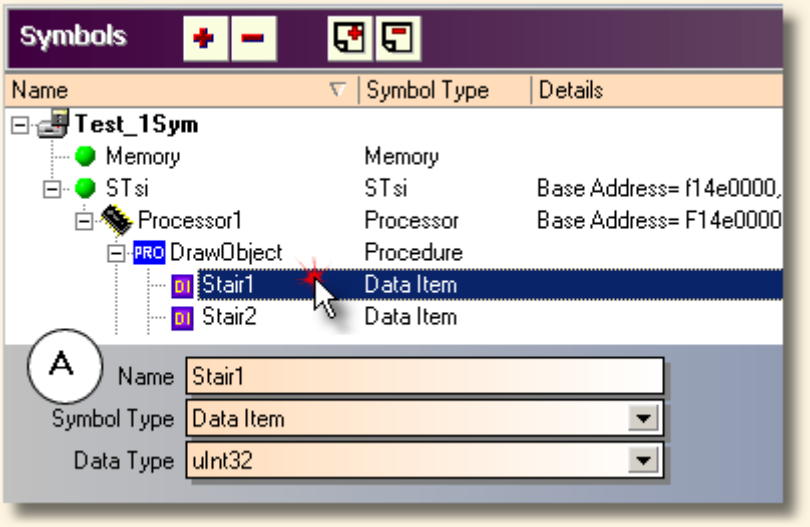
An STsi Data Item Symbol represents a variable within the user's executing code. The user can define as many Data Items as desired in the Symbol Set.

What To Do

When the user selects "Add Symbol" under the desired **Processor** or **parent Symbol**, a new, blank Symbol will appear. The user must enter the Name and select the Data Item Symbol Type. The user must also select the appropriate Data Type See the figure below at **(A)**.

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STsi Procedure Symbol

Why

STsi Data Items are used to time stamp and collect the value of the instrumented variable accesses in the user's software. The user will specify the Data Type that is compatible with the matching variable in the source code of his/ her application. STsi Data Item Symbols are exported in the C Include file as the type defined in the Data Type field. Events collected based on Data Item Symbols are available for view using the Run Time Data Table and Run Time Data Graph. Post Run anlysis of the logged variable accesses are available using the Post Run Analysis tools STsi Timing, Event Table and Event Graph. Each Data Item Symbol consumes one STsi location. There are 1024 STsi locations available in the STsi memory.

Other Options

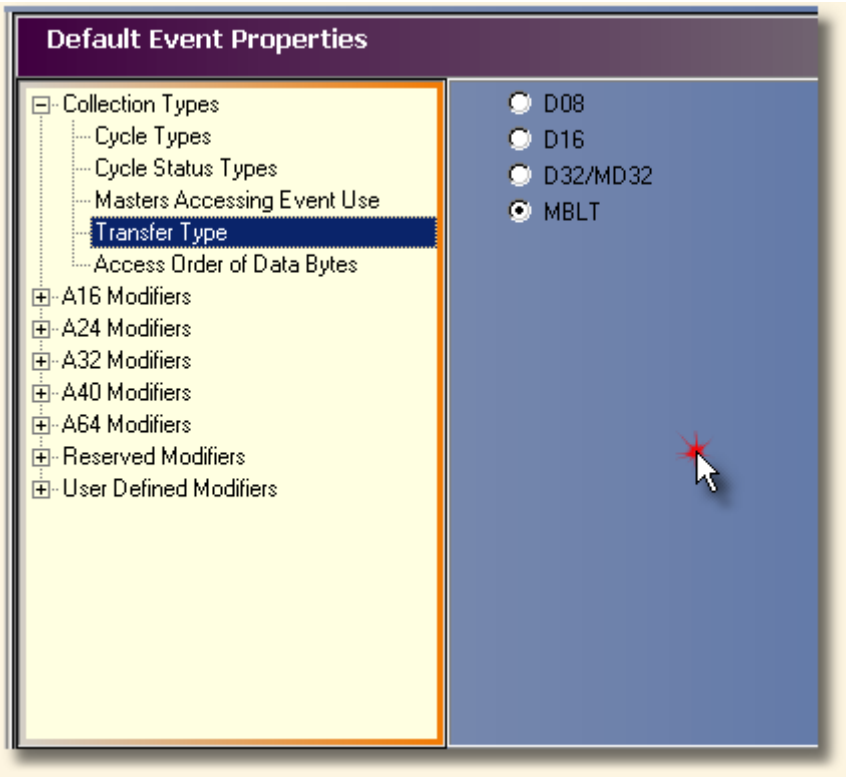
STsi Data Items are dependant upon the ITCNDEFS.h typedef include file.

Data Type	C decelaration	Typedef Definition
Int8	typedef signed char	S8INT; //signed 8 bit
uInt8	typedef unsigned char	U8INT;//unsigned 8 bit
Int16	typedef signed short int	S16INT;//signed 16 bit
uInt16	typedef unsigned short int	U16INT;//unsigned 16 bit
Int32	typedef signed long int	S32INT;//signed 32 bit
uInt32	typedef unsigned long int	U32INT;//unsigned 32 bit
Int64	typedef __int64	S64INT;//signed 64 bit
uInt64	typedef unsigned __int64	US64INT;//unsigned 64 bit
float	IEEE floating point ----Not included in typedef, uses standard compiler definition ---	
double	IEEE double precision floating point ----Not included in typedef, uses standard compiler definition ---	

3.5.3.1.2.4 Default Event Properties

Default Event Properties are specific for each type of module for which Symbol Sets are created. These properties include information on how the SystemTrace will recognize the backplane transactions. Below is an example of the available Default Event Properties settings. For more information on these settings, refer to the section Module specific sections.

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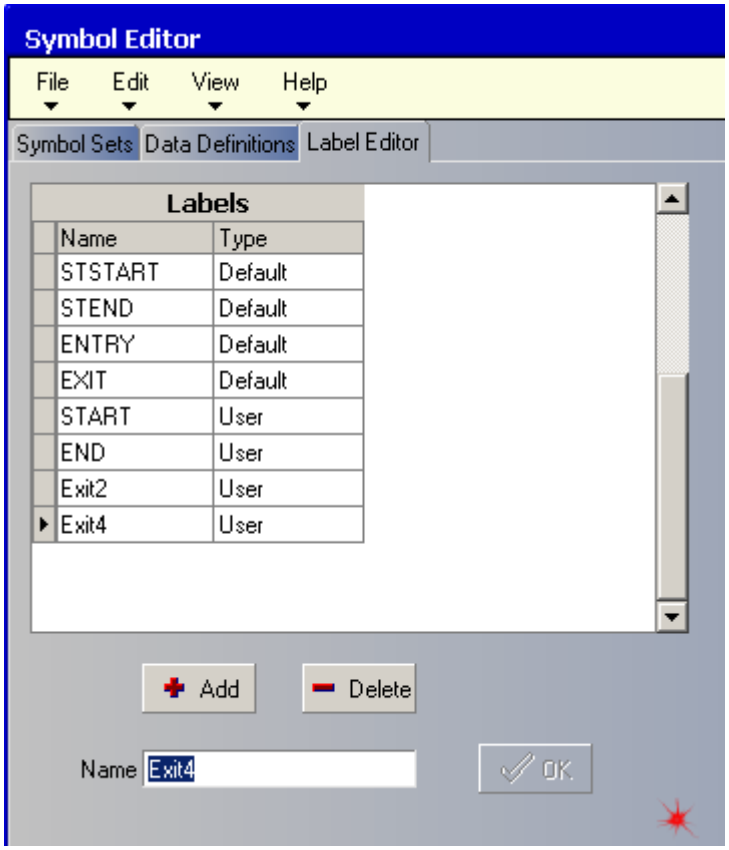
3.5.3.1.3 STsi Labels

STsi Labels are used simpy define satements included in the "C" include file. The user may define labels here for use in assigning values to the STsi Symbols in the instrumented software.

What To Do
In the Symbol Editor, select the Label Editor tab.
To add new labels, click the Add button, enter the Name, and select OK.

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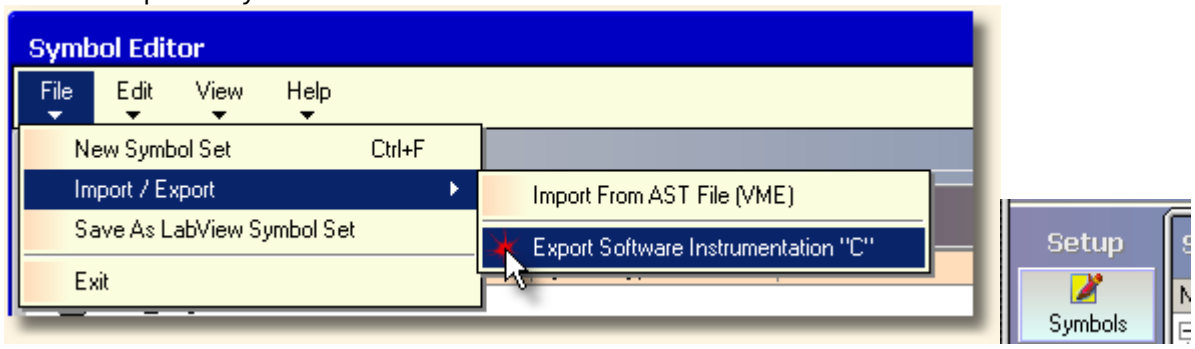
STsi Label Editor

3.5.3.1.4 Exporting C Include File

The final step in creating the STsi Symbol Set is exporting the STsi Symbol information to a C source code include file.

What To Do

From the Symbol Editor drop down menu, select File| Import/ Export| Export Software Instrumentation "C"
Select the file name and destination for the exported file.
Files are exported by default with a ".h" extension.



Exoprting C include file

Why

This generates a C syntax source file that defines the STsi symbols as pointers to the STsi or alternate memory board locations on the backlpane. This is accomplished using the user entered

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Processor Base Address setting. In other words, the Processor Base Address is used as the local address base where the software will write the instrumented Events. This in turn will translate to the STsi or alternate memory card Backplane address.

3.5.3.2 STsi Session

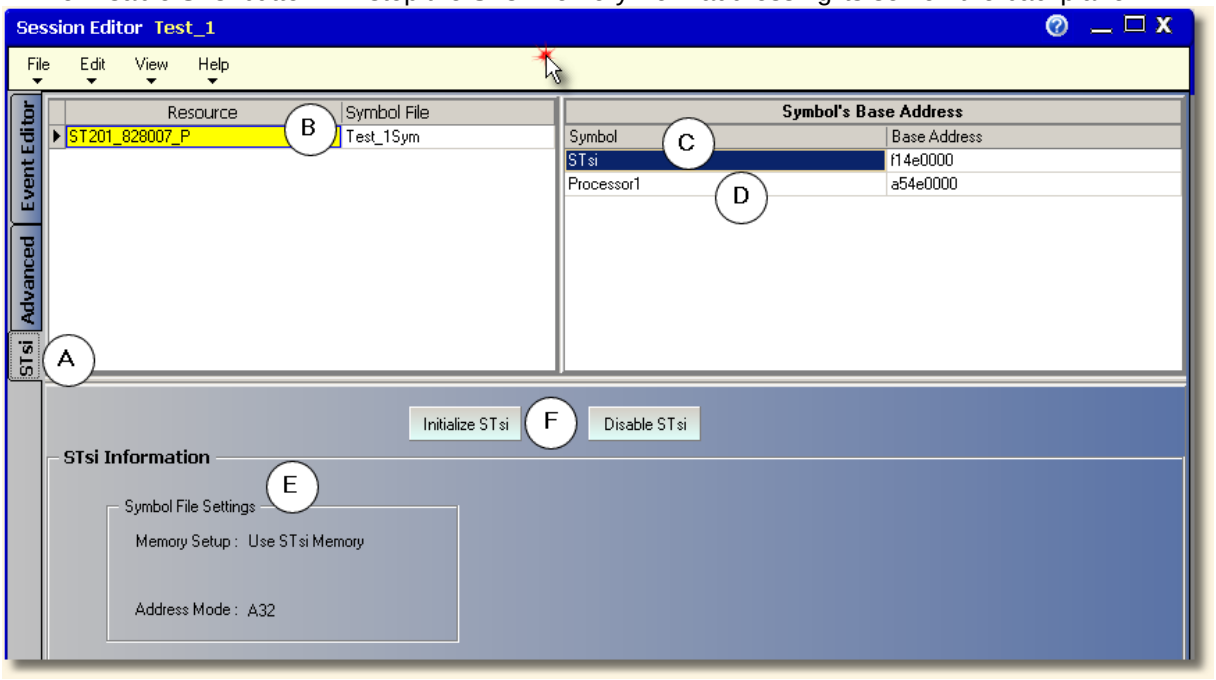
Once the desired Symbol Set(s) have been created using the Session Editor, the user must next add the Symbols desired for monitoring to the Event List. This is accomplised in the Session Editor. The process for adding these Events is identical to adding any other SystemTrace Symbol into the Event List. See the Session Editor section for more information on adding Symbols to the Event List. A Symbol Set with STsi definitions must be selected in order to use the STsi features.

3.5.3.2.1 Enabling / Disabling STsi memory

If the user configured the STsi operations to utilize the STsi memory vs. an alternate memory card, the STsi memory must be initialized.

What To Do

- In the Session Editor, select the STsi tab **(A)**. This tab is only present when a module with STsi is selected).
  - The Resource list will show the SystemTrace Resources in use for this Session along with the Symbol Set selected in the Event Editor tab. **(B)**
  - The Symbol's Base Address pane displays the STsi section **(C)** and any associated Processor Symbols' base address settings **(D)**.
  - The STsi Information **(E)** displays the STsi section information for Memory Settings (STsi or Alternate memory) and any target specific configuration, such as the Addressing Mode for VME backplanes.
- Select Initialize STsi **(F)** to send the displayed configuration to the selected STsi Resource (if STsi memory is being used)
- The Disable STsi button will stop the STsi memory from addressing its self on the backplane



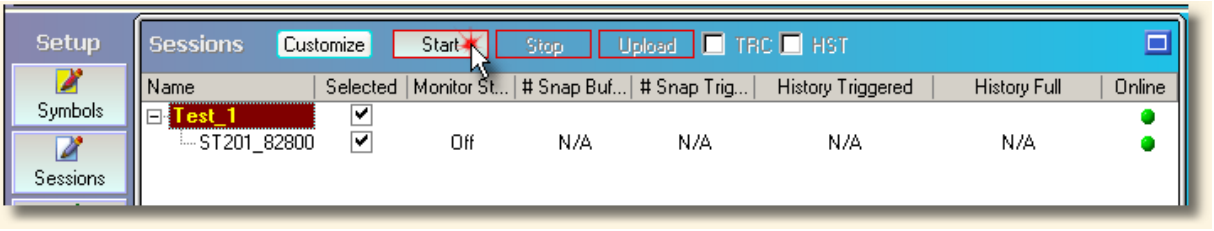
Session Editor STsi Tab

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3.5.3.3 Starting Data Collection

Data Collection begins when the user starts the Session monitor in the Control Console. This is accomplished as explained in the General Operation section. Starting the Session Monitor will enable data collection for the STsi Events and Memory Events defined in the Event List for the Session.

What To Do
In the Control Console, select the desired Session (**Test_1** shown in the figure)
Click on the Start button in the Sessions tool bar to begin monitoring.
Refer to the General Operations section for information on stopping the Monitor and Uploading collected data.



Starting the Session Monitor

3.5.3.4 View RunTime Variables

STsi instrumented variables, which were defined in the Symbol Set as Data Items and placed in the Event List in the Session Editor are available for use in the standard Run-Time Displays of the SystemTrace GUI software. Refer to the Run-Time Analysis section for information on using these displays.

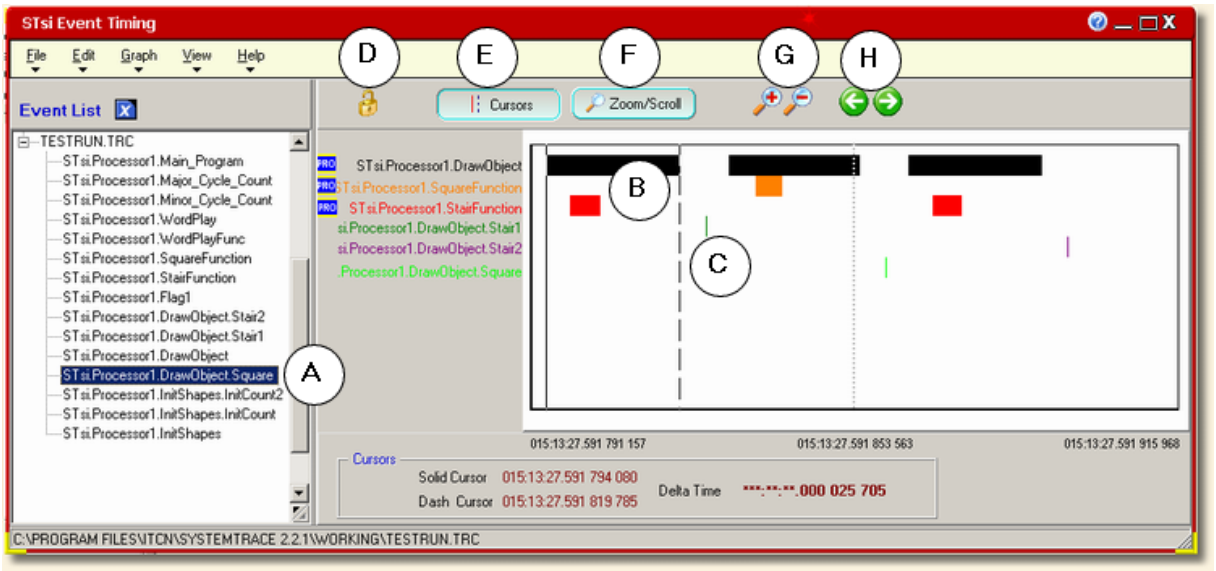
3.5.3.5 STsi Timing Post Run Analysis

Analyzing the timing of the instrumented Procedure Events is accomplised using the STsi Timing tool. This is a graphical display tool that operates similar to the Event Timing tool explained in the Post Run Analysis section. The major features of the STsi timing plot are explained below.

What To Do
Plot Event - Select the Event from the desired file in the Event List **(A)** double click to plot the Event.
Pocedure Plot - **(B)** each plotted procedure is shown as a sold block starting from the recorded entry time (identified by a lower value) to the exit time (identified by a higher value).
Data Item Plot - **(C)** Data Item plots show a mark depicting the time that the variable was accessed in the software.
Lockstep - **(D)** Lockstep allows the user to open other Post Run displays and scroll the displays on all Lockstep enabled displays simultaneously. This operation is valid for any SystemTrace files that were collected at the same time on up to 32 different Resources.
Cursor mouse - **(E)** Turn on the cursors to measure timing of Events in the display. Set the left cursor (solid) using the left mouse button, the right cursor using the right mouse button. Cusrors are mutually exclusive of Zoom/ Scroll, as it sets the mouse operation in the display.
Zoom/ Scroll mouse - **(F)** Turn on the zoom/ scroll operation allowing the user to zoom the display or scroll left/ right. To zoom in left click and hold to the left of the desired area and drag the cursor to the desired limit on the right. Zoom out by dragging left. Scroll the display using the right mouse button.
Zoom/Scoll Buttons - **(G)(H)** provide zoom in/ out and scroll left/ right operations independent of the Cursors/ Zoom mouse selection.

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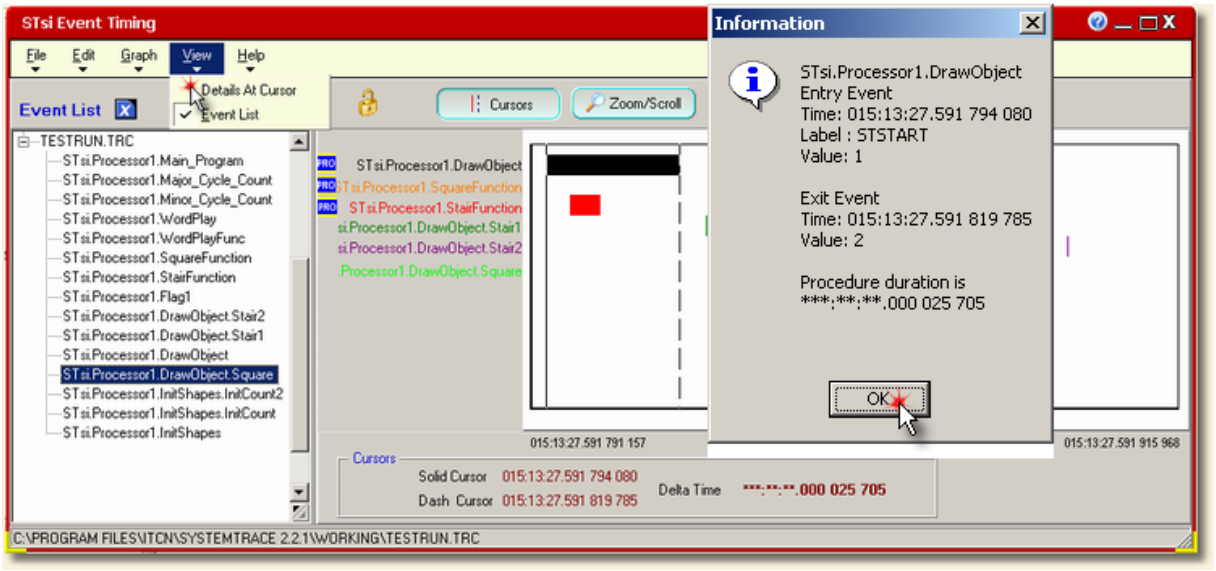


STsi Timing Post Run Analysis Tool

3.5.3.5.1 Event Information

Another feature of the STsi Timing application is the Event Details dialog.

What To Do
Enable the Cursors mouse selection.
Click the left mouse button on the desired Event in the display window.
In the STsi Event Timing menu, select View | Details At Cursor.
The Information dialog window will appear providing the information for the event that the cusror is on.
Procedure Events provide information on Entry time, Exit time, Duration, and Label Values.
Data Item Events provide information on time of occurance and value in a decimal format.

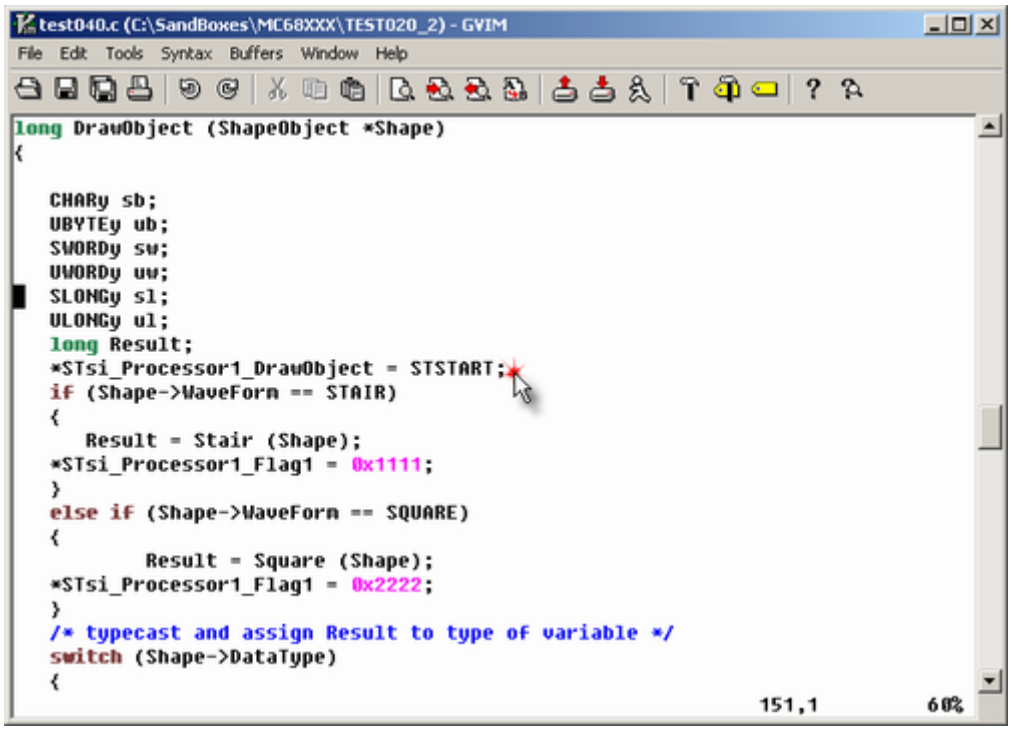


STsi Timing Event Information

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3.5.4 Instrumenting User Code

The most important task in configuring the STsi operation is the instrumentation of the user's source code. This section will cover some of the theory of source code instrumentation using the SystemTrace STsi tools.



3.5.4.1 Understanding STsi Symbols

Symbols and the STsi C Include File

The STsi Symbol set built by the user included a Processor(s), Proceedures, and Data Items. Procedure and Data Item Symbols are exported to a C include file that relates the Symbol Names to pointers that resolve to the STsi or alternate backplane memory using the Processor Base Address. An example of the Symbol Editor generated C include file is shown in the figure below. Symbols are exported into this file as types that are dependent upon how the user defined the Symbol. STsi Symbols are explained as:

STsi Symbol (Section)- The STsi Symbol is not ued in instrumentation of code. It defines where the base backplane address of the memory.

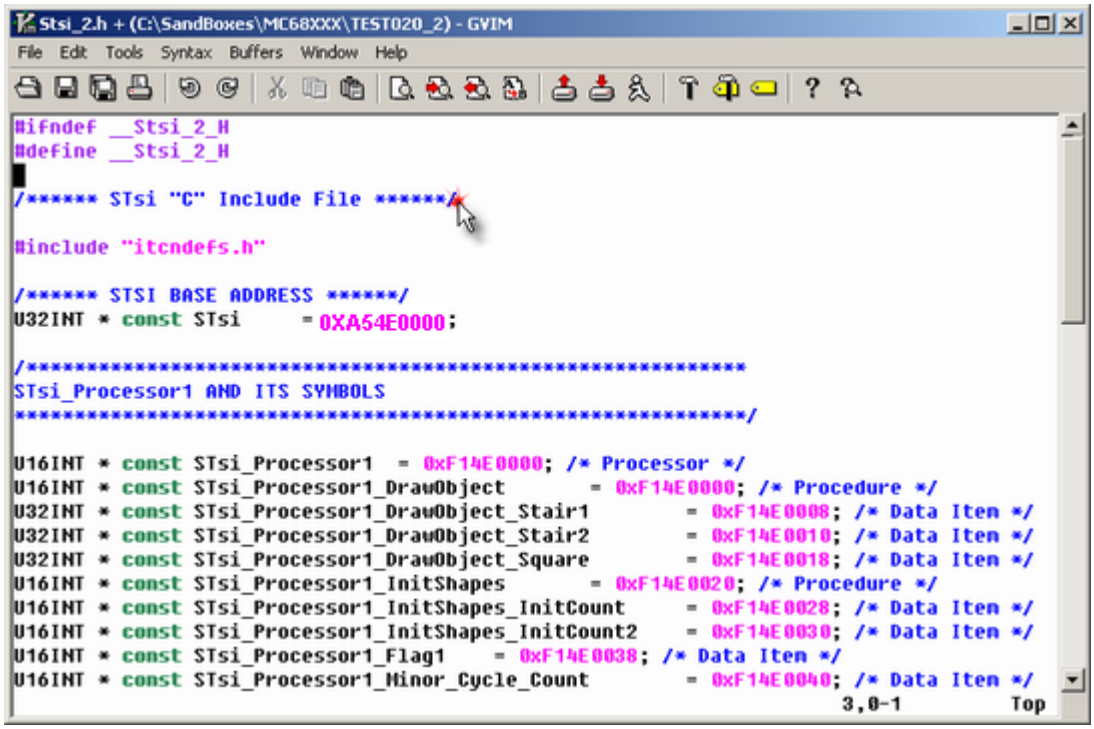
Processor - The Pocessor symbol is not used in the instrumentation of code. It defines the base address of where the other symbols are based.

Procedure - Use a Procedure Symbol to mark the Entry and Exit points of a function call or procedure in the software.

Data Item - Use a Data Item Symbol to feed the value of a variable out to the SystemTrace STsi instruments.

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STsi C Include File

3.5.4.1.1 Procedure Symbols

Procedure Symbols are used to mark the beginning and end of opertions within the user software. Consider the example:

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```
long DrawObject (ShapeObject *Shape)
{

   CHARy sb;
   UBYTEy ub;
   SWORDy sw;
   UWORDy uw;
   SLONGy sl;
   ULONGy ul;
   long Result;
   *STsi_Processor1_DrawObject = STSTART;
   if (Shape->WaveForm == STAIR)
   {
      Result = Stair (Shape);
   *STsi_Processor1_Flag1 = 0x1111;
   }
   else if (Shape->WaveForm == SQUARE)
   {
           Result = Square (Shape);
   }
 ul = (ULONGy) Result;
*((ULONGy *) Shape->Var) = ul;

   /* update the object current cycle */
   Shape->CurCycle++;
   if (Shape->CurCycle >= Shape->NumCycles)
      Shape->CurCycle = 0;
*STsi_Processor1_DrawObject = STEND;
return Result
}
```

The C function DrawObject

Note: declarations are sometimes required to be made
operations within a function. This is why the STsi assig
declarations.

<- STsi_Processor1_DrawObject is a Procedure Symb
Symbol Set. It is assigned the value of STSTART, whi

<- STsi_Processor1_DrawObject here is the same Pro
is assigned the value of STEND, which is defined as 2

The STsi Symbols, which are actually pointers to the STsi memory over the Backplane, are written the values as shown above. The SystemTrace Module logs the occurances of these values and time stamps them with a 15 nanosecond resolution time stamp. In the Timing display, the STsi Timing software will draw a solid block from the lower value (1) to the higher value (2) to indicate the duration of the Procedure Event.

3.5.4.1.2 Data Item Symbols

Procedure Symbols are used to mark the beginning and end of opertions within the user software. Consider the example:

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```
void main_program (void)
{

   unsigned int i;
   unsigned int j;
   unsigned long k; /* a delay counter */
   j=1;

   while (j)
   {

       InitShapes ();
       for (i = 0; i < 300; i++)
       {
          k=0x4ffff;
       *STsi_Processor1_DrawObject_Stair1 = DrawObject (&Stair1);
         *STsi_Processor1_DrawObject_Square =DrawObject (&Square1);
         *STsi_Processor1_DrawObject_Stair2 =DrawObject (&Stair2);
         *STsi_Processor1_Minor_Cycle_Count = i;
         while (k)
                 k--;
       }
       j=j+1;
*STsi_Processor1_Major_Cycle_Count = j;
```

<- STsi_Processor1_D
a Data Item Symbol in
Set. It is assigned the
the function called her

<- STsi_Processor1_M
a Data Item Symbol in
Set. It is assigned the
j, which is incremented
of the main program.

The STsi Symbols, which are actually pointers to the STsi memory over the Backplane, are written the values as shown above. The SystemTrace Module logs the occurances of these values and time stamps them with a 15 nanosecond resolution time stamp. In the Timing display, the STsi Timing software will draw a short verticle line to mark the occurance of the variable. The variable may also be listed in the Event Table display (which will show the backplane address it was written to) and can be plotted in the Event Graph displays.

Another feature of the Data Item events are the availability in Run Time displays. This provides a 10Hz rate real-time display of the variables in the SystemTrace GUI while the program operates. This feature is explained in theRun-Time Analysis section.

3.5.4.2 Modifying the ITCNDEFS file

The file ITCNDEFS.h is included in the "bin" installation directory of the SystemTrace GUI software on the PC workstation. Copy this file to your development directory.

The ITCNDEFS.h file is referenced as an include file in the "C" source include file generated from the Symbol Editor for STsi operations. The default file is shown in the figure below. The user may be required to modify this file for compatability with his/ her compiler.

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```
#ifndef __itcndefs_H
#define __itcndefs_H

/*************************************************************
 ITCN Host independent sizes
*************************************************************/

typedef signed char          S8INT;
typedef unsigned char        U8INT;
typedef signed int      S16INT;
typedef unsigned int    U16INT;
typedef signed long int      S32INT;
typedef unsigned long int    U32INT;
/*typedef           __int64      S64INT;
typedef unsigned __int64     US64INT;*/


#endif
```

The typedefs listed in the ITCNDEFS.h file are used in the S
include file that is exported from the SystemTrace Symbol E

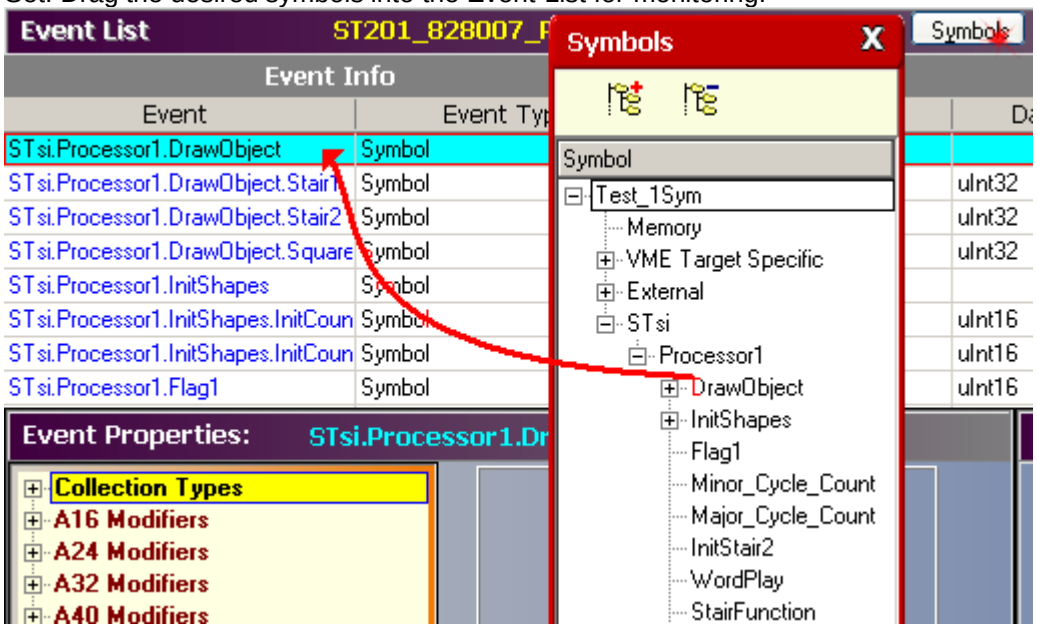
<- signed 8 bit integer, tracked as a hex value
<- unsigned 8 bit integer, tracked as a hex value
<- signed 16 bit integer, tracked as a hex value
<- unsigned 16 bit integer, tracked as a hex value
<- signed 32 bit integer, tracked as a hex value
<- unsigned 32 bit integer, tracked as a hex value
<- signed 64 bit integer, tracked as a hex value //check com
support
<- unsigned 64 bit integer, tracked as a hex value// " " " " "
IEEE floats and double precision floats do not require typed
defined normally in the source.

ITCNDEFS.h typedef file

3.5.4.3 Importance of the Event List

The Event List in the Session Editor contains a listing of the Symbols that will be programmed to the STsi for monitoring. The user must drag Symbols into the Event List if monitoring is desired. If Symbols are used in instrumented software, but not placed in the Event List, they will NOT be monitored.

What To Do
In the Session Editor, click the Symbols button to display a list of all Symbols in the selected Symbol Set. Drag the desired symbols into the Event List for monitoring.

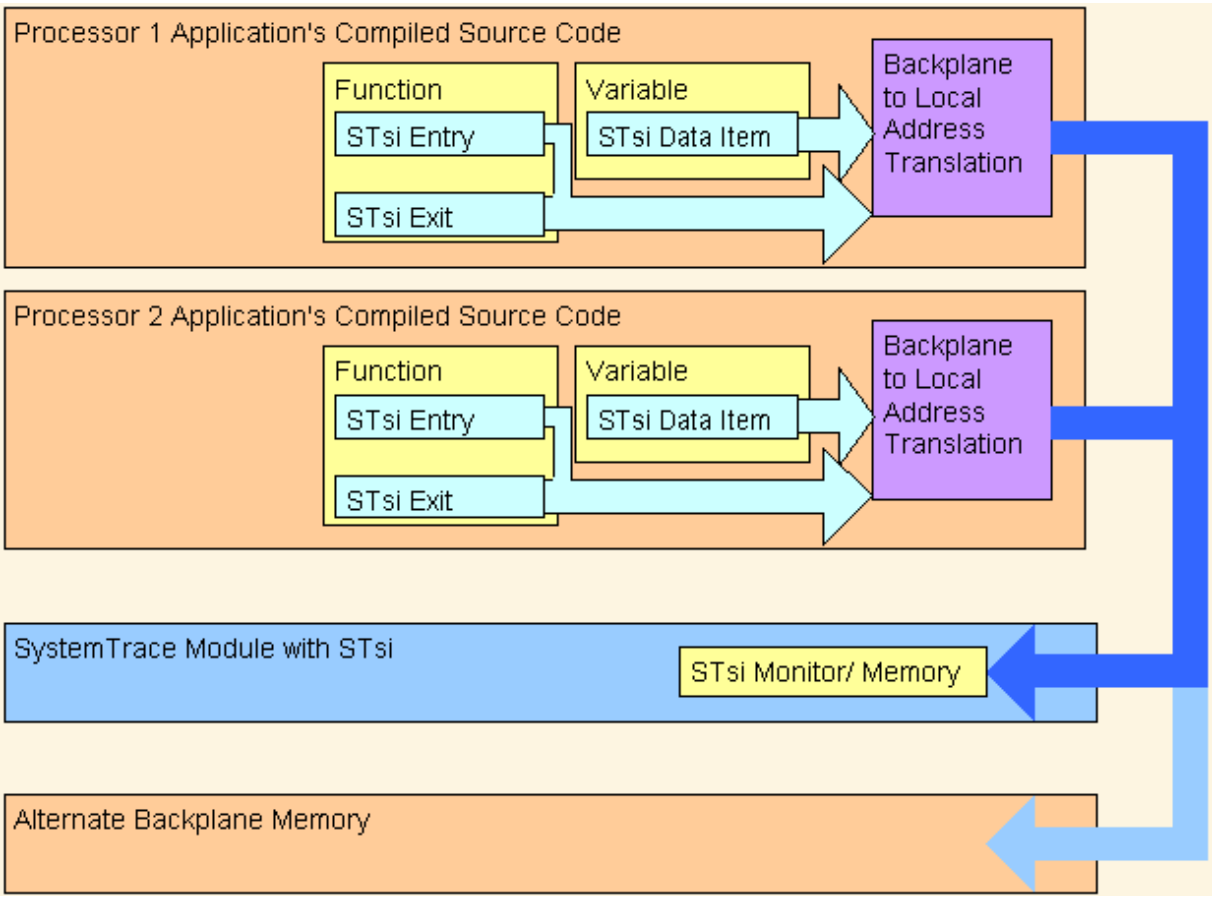


Specifications
Number of Symbols in Event List: 1024 max., 1 min.

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3.5.5 Using Multiple CPU boards

Since SystemTrace STsi is a backplane resource, any device that may access the backplane as a master device may log data to the STsi memory. To use multilpe CPU board in the same chassis, create the required number of Processor Symbols in the Symbol Editor.



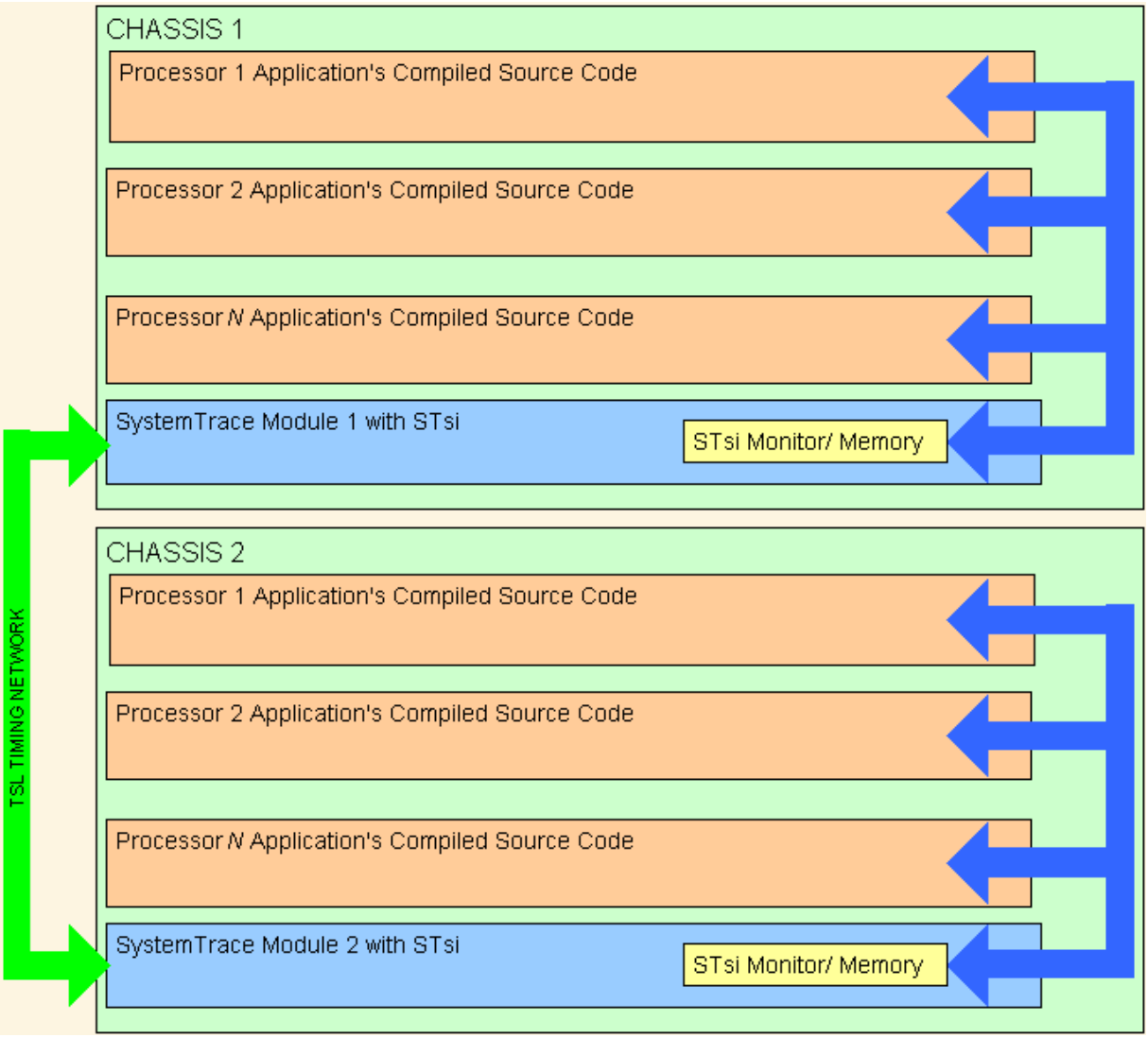
Multi-CPU Logging

3.5.6 Using Multiple Chassis

SystemTrace readily monitors data from multiple sources. The SystemTrace TSL timing network provides time synchronization interconnects for up to 32 SystemTrace Modules. Simply configure logging for each SystemTrace resource, then start them all simultaneously in the SystemTrace GUI software.

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Multi-chassis Operations

3.6 Post Run Analysis

3.6.1 Analysis Chapter Introduction

This chapter covers the SystemTrace Analysis package that examines the collected data after the completion or termination of a Monitor run. The data can be presented in charts, graphic plots, and line-by-line text records. Utilization of the features are demonstrated in the "**What To Do**" sections.

This is only one of two basic Analysis packages available with SystemTrace. The chapter that follows this one covers the Run Time Analysis package, where data is examined while the Monitor is running.

Terms and words used in this manual that are related to SystemTrace attributes are capitalized to distinguish them from their generic uses.

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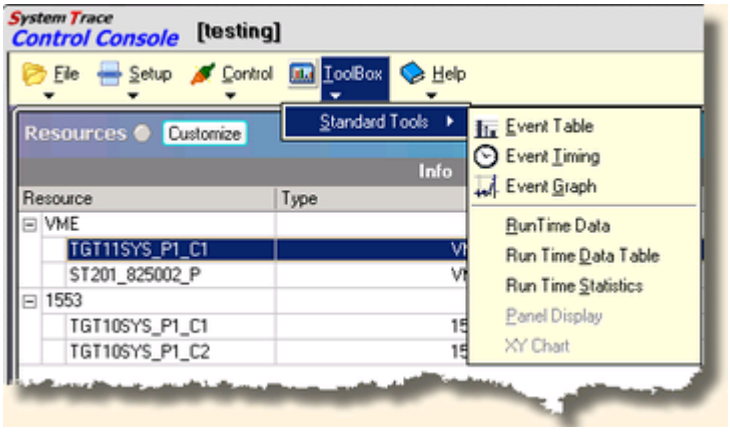
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3.6.2 Analysis Introduction

This chapter explains how to examine the collected data. The reader will learn how the Analysis program presents data, and methods to manipulate the data presentation with the use of filters and display formats. These tools allow the user to examine only the aspects of collected data pertinent to the user's diagnostic goals.
The data collected as specified by the Session and stored by the Module is referred to as Trace data. The unfiltered data from the same test run is referred to as History data. The files that store the Trace data, and named by the user, are called Trace files and have the extension "**.**trc". History data is stored in History files and are automatically assigned the same name as their corresponding Trace files and given a "**.**hst" extension. This collection of history data is a record of all activity on the target, independent of Session specifications (unfiltered).
After the collected data is stored on the Workstation, it is available for processing by the Analysis programs. SystemTrace is equipped with a comprehensive set of post-run data-analysis tools that support the user's review of the data. The tools include:

1. **Event Table** – Displays Log and Snapshot Trace files in tabular, record by record format. Event Table Also Displays History files in this same format.
2. **Event Graph** – Graphic display of Variable Event data plotted over time.
3. **Event Timing** – Graphic display of Function Event access plotted over time.

An Analysis program may be invoked from the SystemTrace Control Console menu bar by selecting the "ToolsBox" | "Standard Tools, as shown in the figure below, *Control Console Tool Box Menu*.



Control Console Tool Box Menu.

Collected Data Files

Event Table, Event Graph and Event Timing data presentations gather data from Trace and/or History files. Trace files may contain data from Snapshots or logging to disk sessions. The Post Run Analysis features support Trace files from both sources, transparently. History files only contain unfiltered data from the History buffer.
Event Table is tied to one file, while Event Graph and Event Timing work with one or more files. The the number of files that may be opened concurrently are not limited.

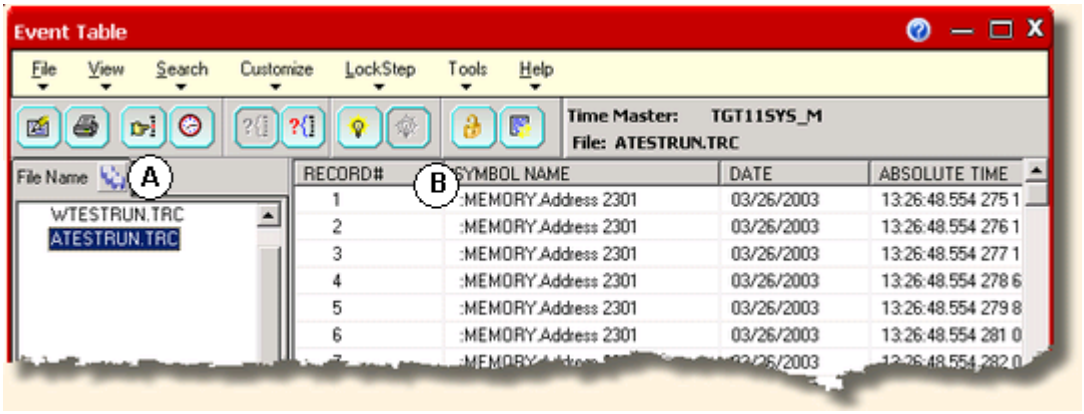
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3.6.2.1 Event Table

The Event Table provides the user a view of all the available Trace and History files and the ability to display the contents of any one of the files in a record list format. The figure below, *Event Table* shows the Event Table's "FileView" pane (A). This is where the file is selected by double clicking on it resulting in its contents being displayed in the record list area (B).

When a file is selected from the File View pane it is automatically opened and an Event Table is created for that file. Each Trace or History file that is available has exactly one corresponding Event Table. To view more than one file at a time requires another Event Table to be opened. When an Event Table is closed, the file is automatically closed.



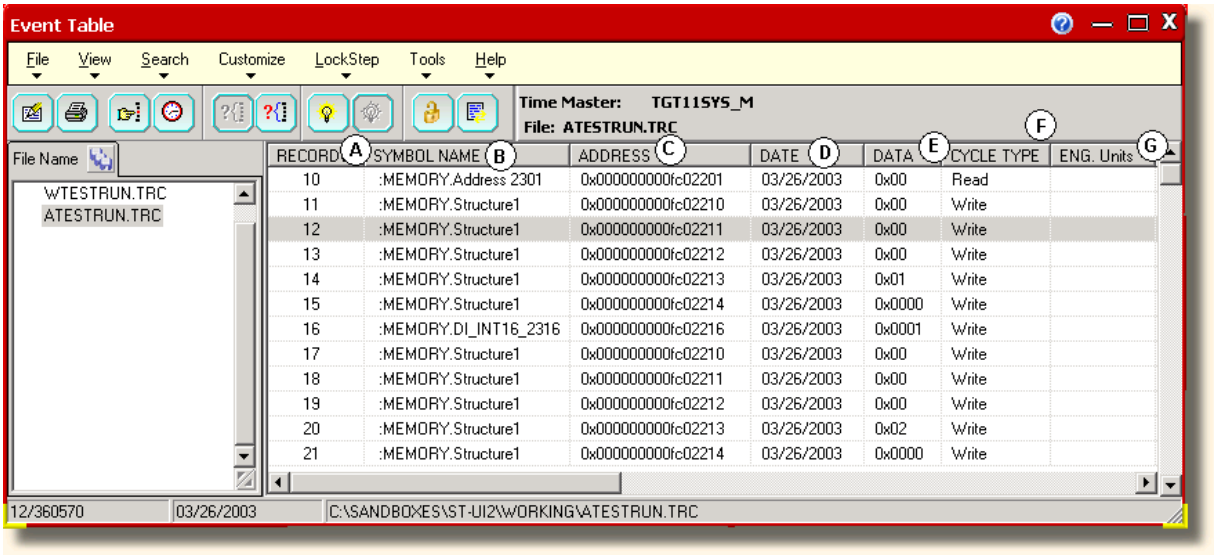
Event Table

3.6.2.1.1 Event Table Window

The data record list area of the Event Table window has columns that can be moved to any order by dragging their headers to a new location. Columns can be selected for inclusion or exclusion in the displays. The appearance of the Event Table is governed by the target type and the users preferences. The example in the figure below, *Event Table Window* is data collected from a VME Module and its columns are selected and arranged to show those common to most targets. The columns that are unique to a specific target are explained in the Module chapter along with other target specific features. The left pane list all the data files available for examination. Double clicking on a file causes the file's contents to appear in the display area replacing the currently displayed file, if any.

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Event Table Window

The following list describes the Event Table features shown in the figure above. Each feature is marked with a letter in a bubble.

A -- Record column is a count sequence of the target transactions captured, record one it the first captured.

B -- Symbol Name column indicates the Symbol the Event was built from that captured the data record.

C -- Data is the raw Data after processing or Reassembled Data, selectable through the Customize | Data menu selections.

D -- Date is the day the record was created, see below for time tracking information.

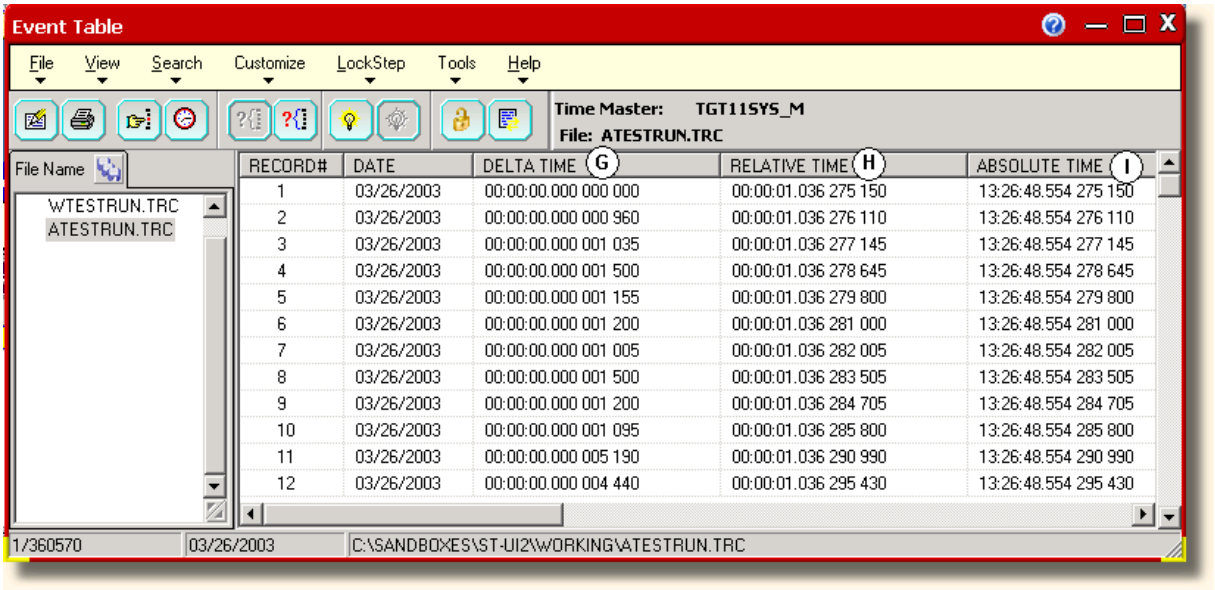
E -- Cycle Type is an indicator of the data flow such as read or write. Cycle Types vary with target types.

F -- Engineering Unit reports the convention used to quantify the data.

The figure below, *Event Table Time Columns* shows the time tracking information available.

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Event Table Time Columns

G – Delta Time is the time difference from one Event to the next.

H – Relative Time is the time the Event occurred based on the start time of the Monitor.

I – Absolute Time is based on the time of day.

The following sections describe the Event Table Speed Buttons and menu bar selections shown in the Event Table Window figure.

3.6.2.1.2 Starting Event Table

Event Table allows the user to view the data collected based on the Events defined in a Session specification. (See Data Collection Mode in the Module Setup section).

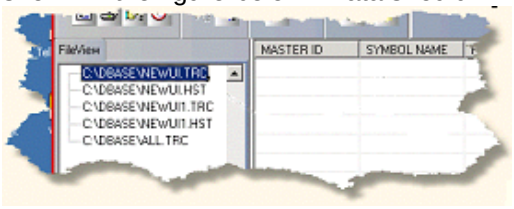
Note: *Before performing the following operations, a Monitoring operation that successfully captured data must be completed and Uploaded to the Workstation..*

What To Do

If the Event Table is not already open, select "Standard tools" from the Control Console menu bar, select Event Table from the sub-menu.

Select "File" from the main menu and "Open" from the drop-down menu. Select a file from the file dialog window. This file selection process may be repeated to fill the File View list. Each selection will be immediately display.

Select an individual file from the File View list by double clicking on a file in the "File View" pane as shown in the figure below. Data should fill all the columns.



File Display Operation

Repeat this procedure to replace the current display and examine any of the files listed in the "FileView" pane.

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Why

The Event Table format shows the user actual values involved in the target's operation, such as address and data values, cycle types, and when the transactions occurred. In Addition to captured data, information on the user setup that captured the data is provided, such as, Symbol name. This format also provides the ability to correlate the display to the user's target program printout.

The format of the Trace file Event Table window and Event Table Window figure, differs slightly depending upon the type of target the file was generated from. For most targets, the default column order is: (1) Record or sequence number, (2) Date the record was captured, (3) Time of day since the Monitor started. The order and contents of the remaining columns are dependent on the target type. The columns displayed in the Event Table and their order can be modified as demonstrated below.

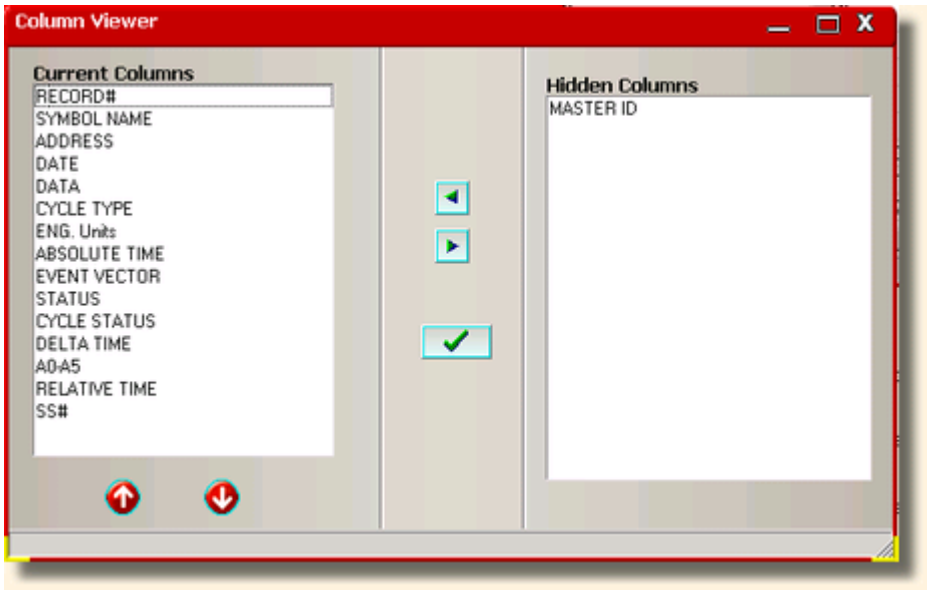
What To Do

Select "Customize" from the menu bar and "Column" from the sub-menu shown in the figure below, *Display Options.*



Display Options.

Use the "Column Viewer" shown in figure, *Column Dialog Window*, to adjust the column display.



Column Dialog Window

The buttons function as follows:

 Moves the highlighted item in the "Hidden Columns" pane into the "Current Columns" pane, which adds the column to the current Event Table.

 Moves the highlighted item in the "Current Columns" pane into the "Hidden Columns" pane, which removes the column from the current Event Table.

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 Moves the highlighted item in the "Current Columns" pane up, which moves the column in the current Event Table to the left.

 Moves the highlighted item in the "Current Columns" pane down, which moves the column in the current Event Table to the right.

 Executes the changes in the Event Table as per Column Viewer dialog box which remains open for any additional changes. Close the Column Viewer by clicking on .

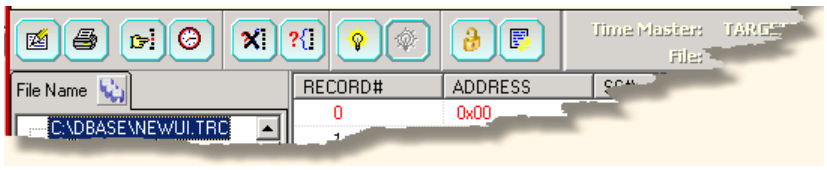
Why
Visual analysis can be made easier by placing columns that are relevant to each other together. For example, when verifying a periodic event, it is helpful to have the Time column next to the Symbol Name column.

Other Options
See the following sections on Speed Buttons and Menu Bar items for more Event Table options.

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3.6.2.1.3 Speed Buttons

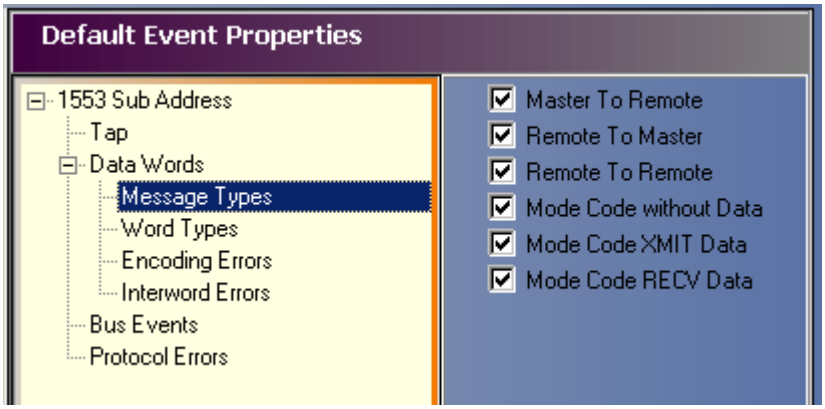


The Speed Buttons provide a shortcut to Event Table menu functions, avoiding the menu | sub-menu selection sequence. This menu selection sequence is printed in bold next to each button in this section so the reader may correlate Speed Buttons with menu functions. The menu bar selection, drop-down menu selection and sub-menu selection are separated by " | ".

 **-- File | Export to File**
Opens a dialog to select all or a portion of the of the Event Table to be stored (printed) in a file.



-- File | Print
Opens a print dialog to select a section of the currently displayed file for hard copy.



-- Search | Record Num
Opens a dialog to specify a Record by number for presentation at the top row of the Event Table.

 -- **Search | Time**
Opens a dialog to specify a Record by Time for presentation at the top row of the Event Table.

 -- **Search | Event**
Opens a dialog to specify an Event for presentation at the top row of the Event Table

 -- **Search | Next**
Finds the Next Event after the one selected in the Search Event dialog (button above).

 -- **LockStep | On** (**Off**)

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Enables or disables the LockStep feature.
LockStep allows multiple files to be reviewed while keeping their time frames synchronized (see Time Master). If Lockstep is engaged, the display will be updated to reflect time frame changes in another Event Tables, Event Graph or Event Timing window.

 --**Customize | Columns**
Opens a dialog to select the order, inclusion or exclusion of the Event Table columns.

 --**Customize | Filter | Specify**
Opens the display filter selection window. Filters allow the user to control the type of Records displayed. For example, the "Read" box could be unchecked to omit read cycles from the display. The filter items available depend on the target type. The user may select any combination of the available filter items. Consult the Module chapter Analysis section for the specific display filters available for each Module. Some generic filter selections are:

- "Frame Updates" – Record reporting a sync that occurs ever 5 or 50 msec (dependent on Module setup). This sync is produced by the SystemTrace Time Master Module.
- "External Events" -- Record reporting an Event occurring on the Module's external signal line at the TSL connector generated by another Module's user defined External output Trigger or and external device.
- "Buffer OverRuns" - When the maximum data collection rate is exceeded the Module inserts Data Overrun records into the Event Table where data was lost.
- "User Events" – These are Events defined by the user during Event Setup procedures, before the test is run

Various Bus attributes may be selected as filter specifications as well.

 -- **Customize | Filter | Disable**
Disables Filter settings so all collected Records in the file are displayed in the Event Table.

**-- Help**
Clicking on this button changes the cursor to a question mark pointer that may be clicked on an item to get a brief pop-up explanation.

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3.6.2.1.4 Menu Bar

The menu bar offers some Event Table control functions in addition to the Speed Buttons. All the Speed Button functions are available from the menus, these items will reference the Speed Button explanation in the previous section. Many of the following menu operations are also available by right clicking within the Event Table window to pop-up menu selections.

File |

Print - See Speed button explanation.

Print SetUp - Opens a dialog for setting up your printer.

Exit - Exits the Event Table, not the SystemTrace application.

Search | To aid in locating specific Events and allow quick movement through the collected data files, several facilities have been provided. These are all selectable from the Event Table menu bar, "Search"drop-down menu. These selections are explained below:

Record Number - See Speed button explanation.

Trigger – Presents the Record that is the Trigger point defined in the Setup dialog. Other occurrence of this Record can be located and displayed by using sub-menu selections: "First", "Previous", "Next", "Last".

Event - Presents a selection of Events that are within the currently displayed file. Specify an Event to search for and use the "Next" button or "Next" menu selection to jump to each occurrence of the selected Event.

String – Opens a dialog where the user selects a Event Table column (e.g. "Data"), enters a Search string value, selects the "Search" direction (Forward or Backward) from the record at the top of the Event Table, and then clicks on the "Search" button. The first Record that complies with the set parameters will be presented at the top row of the Event Table. Click on the "Next" button in the dialog box to display the next record that complies with the set parameters.

Time – See Speed Button explanation.

Customize |

Columns – See Speed Button explanation.

Filters – See Speed Button explanations.

Data | Type – Provides a selection to present values in the data column as Raw processor readable, or Reassembled human readable values based on the specified Engineering Unit displayed in the Engineering Units column. Event data is displayed using the Engineering units defined in the variable Event Specification. The values for the variable Event data are calculated using Scale, Offset, and Units Label.

Data | Octal, Decimal, Hex – Selects the data values radix presentation. Address radix always remains in hex.

View |

Detail - Provides additional information on the selected Record (gray highlighted row) under "Detail" tab at the left portion of the Event Table window.

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File Tree – Makes the "File View" pane (left side) within the Data Display window appears or disappears, contracting or expanding the available space to display columns.

Help - Selecting this item opens the electronic Users Guide. Also see Help Button.

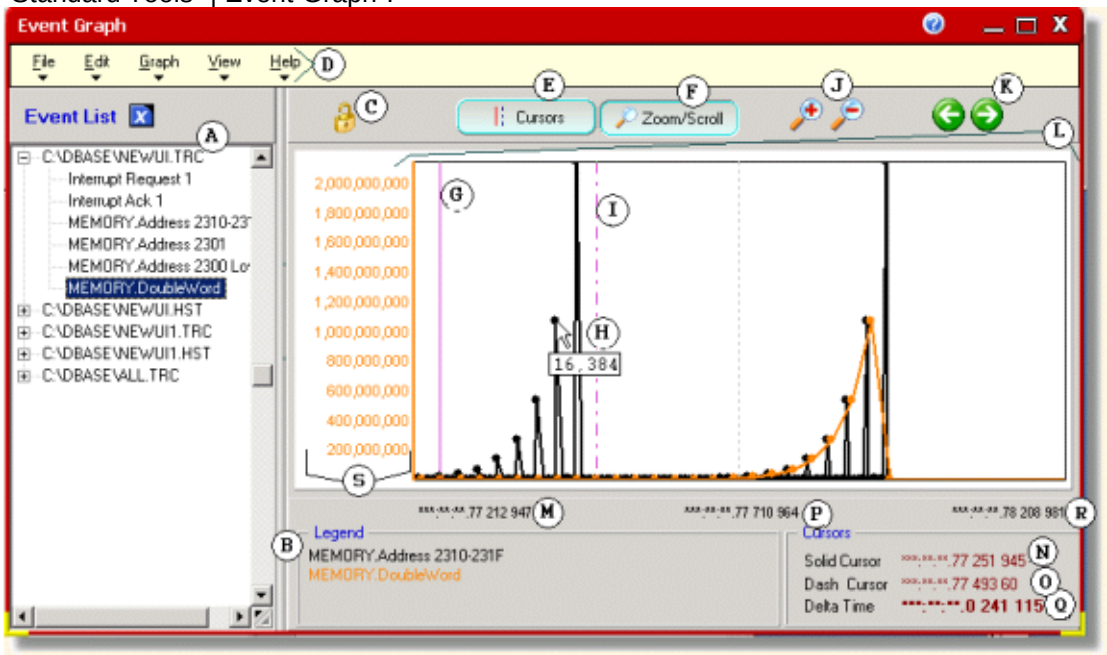
LockStep - See Speed Button explanation.

3.6.2.1.5 Time Master

The Event Table title bar indicates which Module was the Time Master at the time the data was collected. Figure *Event Table Window* shows TARGET9SYS as Time Master Module. The Time Master Module provides time information to all other Modules within the group for their record Time Stamp. Each group of Modules has its own Time Master Module automatically selected by SystemTrace. This Module's name appears in the Event Table title bar. Each Time Master Module and its group members are independent from each other; this should be considered when time-correlating with Event Table of different Time Masters. For more about Module groups, see Multiple Module Synchronization in the Module chapter.

3.6.2.2 Event Graph

Event Graph displays the variable Events in graph form, where the horizontal axis is time and the vertical axis are variable Event values. Up to eight variables from different files may be plotted simultaneously on a single time-line. These files may be from the same or different targets. Open the Event Graph window by selecting from the Control Console menu bar, "Tool Box" | "Standard Tools" | Event Graph".



Event Graph Window

The work area of the Event Graph window displays each Event plotted as it is added to the graph. The following list describes the Event Graph window features shown in the *Event Graph Window figure above.* Each feature is marked with a letter in a bubble.

A- Event List pane shows the Events available for plotting.

B- Name of a variable in the plot

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C- Lockstep check box, allows two or more SystemTrace graphic displays to be time correlated.

D- Event Graph window menu bar.

E- Cursor button, enables cursor (G) and (I) positioning and readout at lower right of the window (N) and (O). Also disables cursor Zoom Scroll function to revert to button ((J) and (K)) only controls.

F- Zoom/Scroll button, enables scrolling by holding the right mouse button down and moving the mouse right or left to scroll horizontal, or zone zoom by a left click and hold, move the mouse to enclose a zone then release click.

G- Solid line cursor. With Cursors button (E) down the line cursor may be positions by left clicking on a plot point and its temporal value read at (N).

H- Placing the mouse cursor on any plot point displays the variable value at that point.

I- Dash line cursor. With Cursors button (E) down the line cursor may be positioned by right clicking on a plot point and its temporal value read at the bottom right of the window (O) .

J- Zoom in, zoom out, buttons.

K- Scroll buttons.

L- Plot area. Events selected for plotting are doubled clicked in the Event List (A).

M- Time at the beginning of the chart.

N- Temporal position of Solid (N) line cursor is reported here when the Cursors button (E) is down.

O- Temporal position of the Dash (O) line cursor is reported here when the Cursors button (E) is down

P- Time at the center of the chart.

Q- Time deferential between cursors (G) and (I) when the Cursors button (E) is down.

R- Time at the end of the chart.

S- Y axes scale, shows the range of values of the selected variable, shown here for "Memory DoubleWord". Scale color matches plot color and pertains only to the plot of the same color.

The "Event Table" section, sub-section "Search- "Time" in this chapter explains how to use the Search feature. Using a Time search can find records that correspond to a data points on the Event Graph plots. Do this by place the cursor at a point of interest on the plot and note the cursor's temporal value ((G) or (H)) in the figure). Open the Event Table click "Search" on the menu bar and Time from drop-down menu. Enter the cursor's temporal value and click OK. The record that corresponds to the data point in Event Graph plot will be highlighted.

MORE

- Starting Event Graph

RELATED TOPICS

- Event Timing Window

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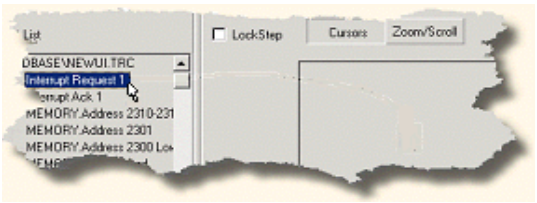
Event Table

3.6.2.2.1 Starting Event Graph

To start Event Graph, a Trace file from a Monitor run must be available.

What To Do
Note: The letters enclosed in (parentheses) refer to the figure above, Event Graph Window.

Open Event Graph from the Control Console menu item "ToolBox" sub-menu item Event Graph. Select "File" from the main menu and "Open" from the drop-down menu. Select a file from the file dialog window. This file selection process may be repeated to fill the Event List pane. Click on the ⊞ next to the files in the Event List to expand the tree and make Events visible for selection.
To select an Event to be plotted in the Event Graph window, double click on an item in the Event List pane as shown in the figure below, *Selecting Variable to Plot*.
The system will do an Event scan of the data file and will then generate a plot, as shown in *Event Graph Window* figure.



Selecting Variable to Plot

Adjust the plot using the Zoom and Scroll button (J) and (K).
Click on one of the vertical cursors in the plot area and drag it to any point of interest on the plot.
Read the temporal value of the cursor at the bottom right of the Event Graph window (N) or (O).
Read the variables value by placing the mouse arrow cursor on a plot point ((e.g. (H)) or read it from the scale to the left of the plot area.

Why
Plotting a variable is a way to see trends in its value and time fluctuations. An anomaly in a regular cycle may be more obvious when the cycles are presented in a graph where the user can Zoom in, set the cursor, and then read the anomaly's time and value.

Other Options
An alterant method of Zoom and Scroll can be used by selected the Zoom/Scroll button (F) and Scroll by holding the right mouse button down and move the mouse right or left to scroll horizontal or Zoom in the graph area between a left click and hold, move mouse, left release click.

Several variables may be double clicked to create multiple plots. Each Event plotted has its name displayed at the bottom left of the Event Graph window (B). Double click on the Event name to display a scale relevant to its range of values (S), or right click on the Event name and select "Active Access" from the pop-up menu shown in the *Plot Control Menu* figure below.



Plot Control Menu.

A plot style may be selected by right clicking on the Event name (H) and selecting "Line" or "Points" from the menu shown in figure, *Plot Control Menu*, above.
A plot may be removed by selecting "Delete" from the menu.

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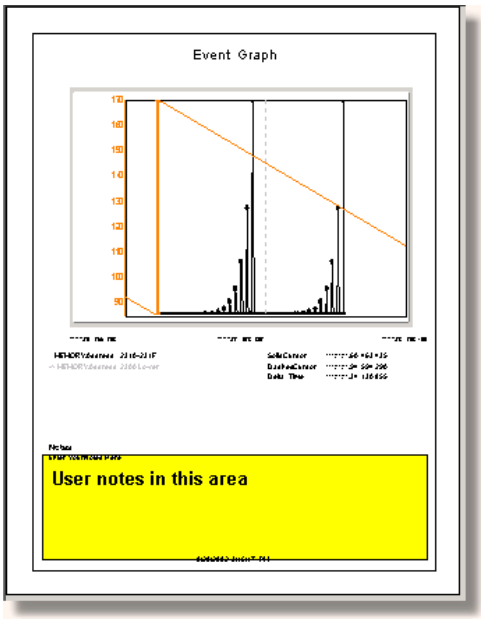
The selection on the Event Graph menu bar (D) provide many of the same control and option just discussed. From "View", the Event List pane may be closed resulting in an expanded plot area. The "Graph" menu also provides a plot style selection, but this selection will change all the plots to data points or lines rather than an individual plot as the menu in the figure *Plot Control Menu* does. Lockstep is another selection under the "File" menu, which has the same function as clicking on the lock icon (C).

The mouse cursor plot point readout (H) will only flicker if two or more points are overlaid. Zoom in to point at a single plot point.

Under the "File" menu, "Print" may be selected to make a hard copy of the Event Graph screen. *Figure Event Graph Printout* shows an example of a plot print out. The print dialog provides a text input window to add notes to the print out shown at the button of the figure.

What To Do

From the Event Graph's menu bar select "File" | "Print". This opens a text entry dialog that will allow the user to add notes to the printout.
When notes are complete, click the OK button to open a print setup dialog. Click a radio button to select the desired destination of the printout.
If the destination is Printer, click the Setup button to open a printer setup dialog.
Click the OK button to printout the screen image with your notes
If the destination is File, click on the format dialog box and select the desired format then click on the floppy disk icon to open a file destination browser. Select the path and enter a name for the printout file and click the Save button. Finally, click the OK button to exit the dialog.



Event Graph Printout

Specifications

Maximum number of plots per window	8.
Maximum Event Graph window per Workstation	3.
Maximum Time Scale Range	
Time Scale Resolution	
Plot color rotation	Black, White, Red, Green, Violet, Yellow, Dark Blue, Blue.

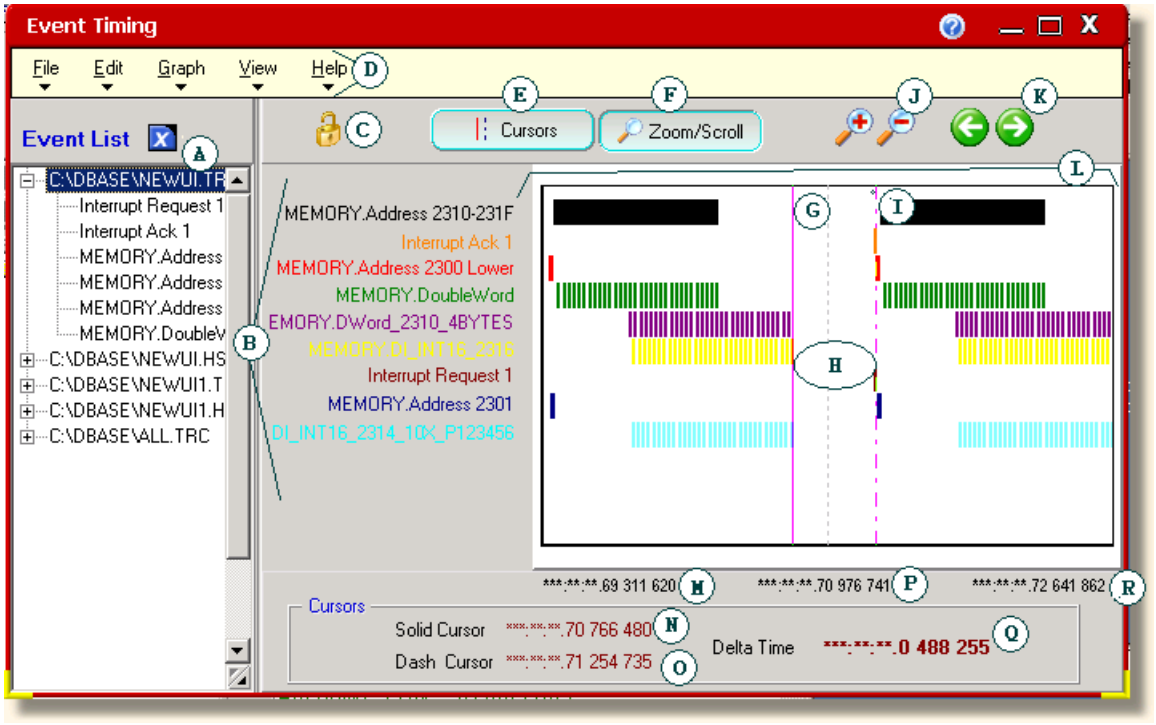
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3.6.2.3 Event Timing

The Event Timing window provides a graphic view of processor execution and bus message flow of the target system. The flow is graphically displayed in a chart form, where the horizontal axis is time and the vertical axis portrays a process (procedure/ message defined as System Trace Events) structure chart. Each process consists of information gathered from the real-time execution of the target system. The charts indicate the time a procedure or message was active.

Open the Event Timing window by selecting from the Control Console menu bar, "Tool Box", "Standard Tools", Event Timing.



Event Timing Window

The work area of the Event Timing window displays each Event plot as it is added to the chart area. Controls and interpretation of the Event Timing window are similar to the Event Graph window, an understanding of the previous Event Graph section will be helpful in understanding the Event Timing window.
The following list describes the Event Timing window features shown in the figure above, *Event Timing Window.* Each feature is marked with a letter in a bubble.

A- Event List pane shows the Events available for plotting

B- List of Events being charted. Name font color matches chart color.

C- Lockstep check icon, allows two or more SystemTrace graphic displays to be time correlated.

D- Event Timing window menu bar.

E- Cursors button, enables cursors (G) and (I) positioning and readout at lower right of the window (N) and (O). Also disables cursor Zoom Scroll function to revert to button ((L) and (M)) only controls.

F- Zoom/Scroll button, enables scrolling by holding the right mouse button down and move the mouse right or left to scroll horizontal, or zone zoom, by a left

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click and hold, move the mouse to enclose a zone then release click.

G- Solid line cursor. With Cursors button (E) down, it may be positions by left clicking on a plot point and its temporal value read at (N).

H- Shows how cursor can be positioned to determine the time between repetitive cycles.

I- Dash line cursor. With Cursors button (E) down, the Dash line may be positioned with the mouse cursor and its temporal value read at the bottom center of the window (O).

J- Zoom in, zoom out, buttons.

K- Scroll Buttons.

L- Chart area. Events selected for charting are double clicked in the Event List (A).

M- Time at the beginning of the chart.

N- Temporal position of the Solid line cursor (G) is reported here.

O- Temporal position of the Dash line cursor (I) is reported here.

P- Time at the center of the chart.

Q- Time deferential between cursors (G) and (I).

R- Time at the end of the chart.

The "Event Table" section, sub-section "Speed Buttons", "Time | Search" topic explains how to use the Search feature. Using a Time search can find records that correspond to a data points on the Event Graph plots. Do this by place the cursor at a point of interest on the plot and note the cursor's temporal value ((N) or (O)) in the figure above). Open the Data Display Table click "Search" on the menu bar and Time from drop-down menu. Enter the cursor's temporal value and click OK. The record that corresponds to the data point in Event Timing chart will be highlighted.

MORE

Starting Event Timing

RELATED TOPICS

Event Graph Window

Event Table

3.6.2.3.1 Starting Event Timing Chart

To start Event Timing, an Event Trace file from a Monitor run must be available.

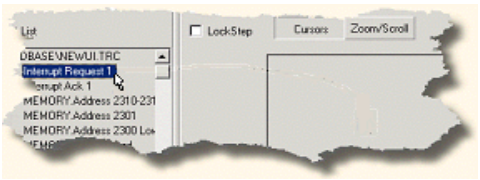
What To Do

Note: The letters enclosed in (parentheses) refer to figure Event Timing Window above.

Open Event Timing from the Control Console menu item "ToolBox" sub-menu item Event Timing. Select "File" from the main menu and "Open" from the drop-down menu. Select a file from the file dialog window. This file selection process may be repeated to fill the Event List pane. Click on the ⊞ next to the files in the Event List to expand the tree and make Events visible for selection.
To select an Event to be charted in the Event Timing window, double click on an item in the Event List pane as shown in the figure *Selecting Events to Chart*, below.
The system will do an Event scan of the data file and will then generate a chart, as shown in the figure above, *Event Timing Window*.

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Selecting Events to Chart

Adjust the plot using the Zoom and Scroll button (J) and (K).
Click on one of the vertical cursors in the chart area and drag it to any point of interest on the chart.
Read the temporal value of the cursor at the bottom center of the Event Timing window (N) or (O).
Read the time between repetitive cycles by placing the Solid Line cursor at the end of the first cycle and the Dash Line cursor at the beginning of the second cycle ((e.g. (H)). Read the Delta Time displayed at the bottom right of the Event Timing window (Q).

Why
Charting Event cycles and procedures is a way to see time utilization of these Events. When and how long a cycle takes place is more obvious when the cycles are presented in a chart where the user can Zoom in, set the cursor, and then read the time and value.

Other Options
An alterant method of Zoom and Scroll can be used by selected the Zoom/Scroll button (F) and Scroll by holding the right mouse button down and move the mouse right or left to scroll horizontal or Zoom in the area between a left click and hold, move mouse, left release click.

Several Events may be double clicked to create multiple Event charts. Each Event charted has its name displayed at the left of the Event Timing window (B). Right clicking on the Event name pops-up a "Delete" button to remove the Event from the chart, shown in the figure, *Chart Delete*, below.

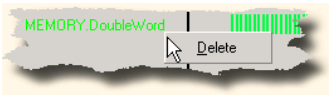


Chart Delete.

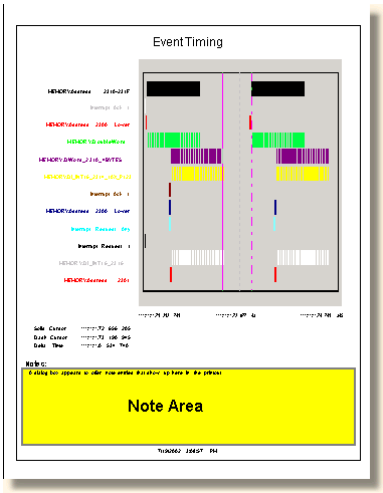
The selection on the Event Timing menu bar (B) provide many of the same control and option just discussed. From "View", the Event List pane may be closed resulting in an expanded chart area. Lock step is another selection under the "File" menu, which has the same function as the checking the lock icon (C).

Under the "File" menu, "Print" may be selected to make a hard copy of the Event Timing screen. Figure *Event Timing Printout*, shows an example of a Event Timing screen printout. The print dialog provides a text input window to add notes to the printout shown at the bottom of the figure.

What To Do
From the Event Timing's menu bar select "File" | "Print". This opens a text entry dialog that will allow the user to add notes to the printout.
When notes are complete, click the OK button to open a print setup dialog. Click a radio button to select the desired destination of the printout.
If the destination is Printer, click the Setup button to open a printer setup dialog.
Click the OK button to printout the screen image with your notes
If the destination is File, click on the format dialog box and select the desired format then click on the floppy disk icon to open a file destination browser. Select the path and enter a name for the printout file and click the Save button. Finally, click the OK button.

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Event Timing Printout

Specifications:

Maximum number of plots per window	12.
Maximum Event Timing window per Workstation	3.
Maximum Time Scale Range	
Time Scale Resolution	
Plot color rotation	Black, White, Red, Green, Violet, Yellow, Brown, Dark Blue, Blue

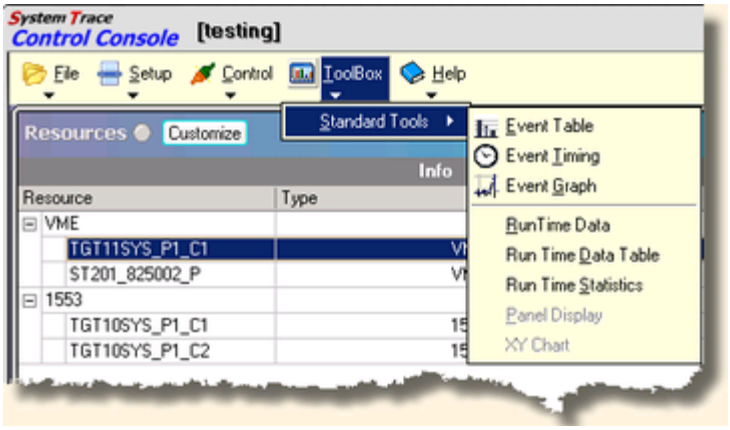
3.7 Run Time Analysis

3.7.1 RunTime Chapter Introduction

This chapter covers the SystemTrace Analysis package that examines data while the Monitor is running. The data can be presented in charts and graphic plots. Utilization of the features are demonstrated in the "**WHAT TO DO**" sections.
Terms and words used in this manual that are related to SystemTrace attributes are capitalized to distinguish them from their generic uses.

This is only one of two basic Analysis packages available with SystemTrace. The chapter that proceeds this one covers the Post Run Analysis package, where data is examined after the Monitor is stopped and data uploaded from the Module to the Workstation.

Each Analysis program is invoked from the SystemTrace Control Console menu by selecting the "ToolBox" | "Standard Tools"|..., as shown in the figure below *Control Console Tool Box Menu*.



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Control Console Tool Box Menu

3.7.2 Run-Time Data Graph

The RunTime Data Graph window displays the changing values of selected Data Items (variables) in an "X" "Y" graph format. Each Trace is represented by a color in the setup panel. Each Trace has a drop-down dialog box presenting the variables available for plotting. Other features are available for adjusting the display and viewing data, which are explained in the following sections. The figure below, *Run-Time Window* shows an example of the Run-Time Data display Plotting three variables, Pressure, Temperature, and Power.



Run-Time Window

The list below identifies the Real-Time window features, explanations of their use are provided in the sections that follow.

(**A**) -- Trace LEDs. Click ON to make its variables available for plotting.

(**B**) – Trace (1 through 8) variable selection box. Select from a drop-down list of variables for plotting. Variables are those from the Session currently running.

(**C**) -- Open an amplitude setup dialog

(**D**) – Plot scale.

(**E**) – Variable's value at the cursor plot intersection.

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(**F**) – Trace LED selected for plot scale division setting and ground reference.

(**G**) – Cursor. Use the mouse to move it through time (horizontal) to get a variable value reading (E).

(**H**) – Ground Switch. Click on to find a selected plot's (F) ground level.

(**I**) – Increase / decrease Scale division buttons for the selected (F) plot.

(**J**) – Offset wheel to set the vertical position of the zero reference (see (H)) of the selected (F) plot.

(**K**) – Time scale. 250ms per division.

What To Do

First, the Session should already be running with the target system generating traffic on the desired bus.
Click on the Start button in the RunTime Data window and select the desired SystemTrace Resource for monitoring.
Select a screen Trace LED by clicking on the LED next to the Trace number.
Next, click on the button across from the LED to drop-down a list of Event variables, click on the one to plot.
Plot adjustments may be made as described in the following sections.

3.7.2.1 Plot Control

Plot Control Buttons:
Provides control of how and when the plot progresses and chart display.



Plot Control Buttons

Start Button:
Opens a list of Resources available which upon selection makes its variables available in the Trace dialogs at the top of the window.

Stop Button:
Opens a list of Resources which upon selection removes its variables from the Trace dialogs at the top of the window.

Setup Button:
Switches between an expanded chart area or expanded Setup controls.

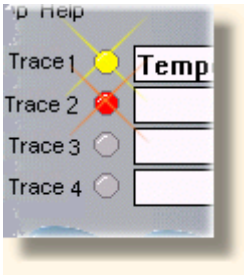
Clear Button:
Starts trace over from the left of the chart.

3.7.2.2 Trace LED

Trace LED: (Trace *n*) indicates when on, the variable in the adjacent box is being plotted. LED and Trace color match. The figure below shows Trace 1 and Trace 2 selected and the variable "Temperature" selected for plotting. When an LED is clicked off, the screen trace stops

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Trace LEDs.

3.7.2.3 Trace Dialog

Trace Dialog: Clicking the to the right of the variable name box presents variables available for plotting. Click on the variable name to have a plot of its value on the RunTime chart. The Trace color on the screen will match the LED. The figure below shows the Trace list box with the variable, "Temperature" selected.



Trace Dialog

3.7.2.4 Trace Amplitude Setting

Each Trace may have its amplitude scale set individually. Select the Trace LED (right of window not top) to read or adjust its scale. The Trace is identified by its LED color.

What To Do

Adjusting the scale may be done by clicking on the scale buttons to increase or decrease the scale. The units per division will read out above the buttons. Each Trace has its own scale and its LED must be selected to interpret the amplitude of the variable's trace.

Why

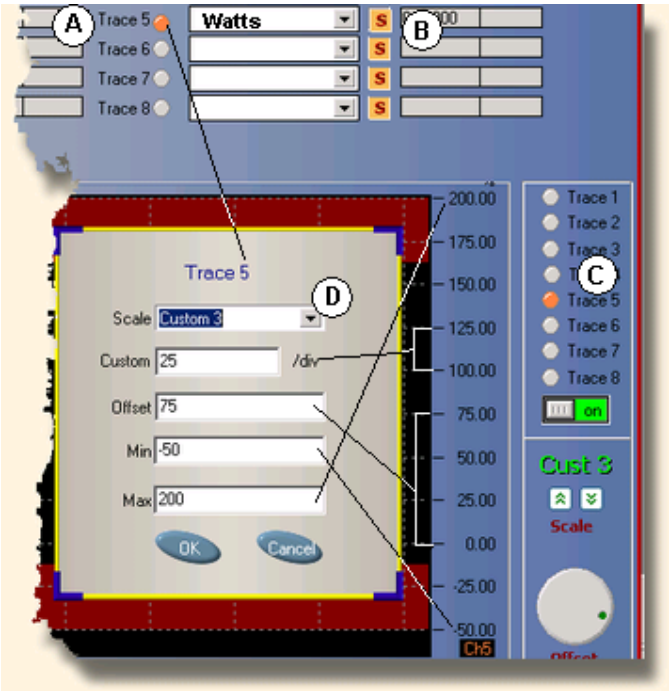
Setting the Scale and Offset adjusts the visual presentation of the Trace. This can enlarge the vertical characteristics of the Trace for closer examination. Reducing the vertical swing by increasing Scale division values can make it easier to compare multiple Traces in the display.

Other Options

The Scale may be adjusted with a Scale setting dialog box shown in the figure *Scale Dialog* below.

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Scale Dialog

Refer to the *Scale Dialog* figure for the following explanation.

Select the Trace that is to have its Scale adjusted by clicking on its Trace LED shown at (A) in the *Scale Dialog* figure.
Open the Trace Scale dialog window by clicking on the "S" button (B)
Select a Scale division value from the "Scale" box drop-down by clicking on the "▼" (D). If you wish to set a Scale that is not in the drop-down list, select "Custom *n*" ("*n*" being a number that will represent a stored custom setting).
The lines in the figure show how the values in the "Custom", "Max" and "Min" boxes pertain to the chart scale. The value in the "Offset" box is the value of the scale's zero point from the chart's horizontal centerline, as shown in the figure.

Enter an Offset value. This is the value you want the zero point to be from midway on the screen scale.
Enter the lowest value of the variable you wish to be at the bottom of the scale in the Min box, or
Enter the highest value of the variable you wish to be at the top of the scale in the Max box.

Note: *The value in the dialog will interact and self adjust to fit the screen format.*

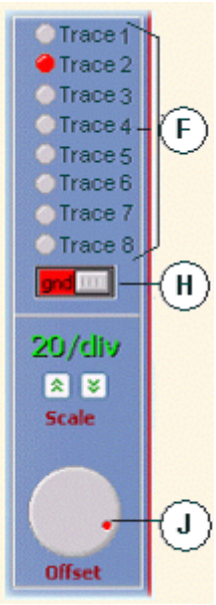
3.7.2.4.1 Zero Reference

A Trace on the chart will sketch out its deviation from a zero level. This zero level also determines the physical location of the trace on the chart display. Refer to the figure below, *Trace Control*.

What To Do
Set the zero level for a trace by selecting its corresponding Trace LED (**F**).
Click on the grounding button (**H**), its indicator turns red and the trace will plot a flat line at zero level.
Move the zero level to the desired location on the chart display by rotating the Offset dial (**J**).
Click on the grounding button to resume plotting values from zero level reference just set.

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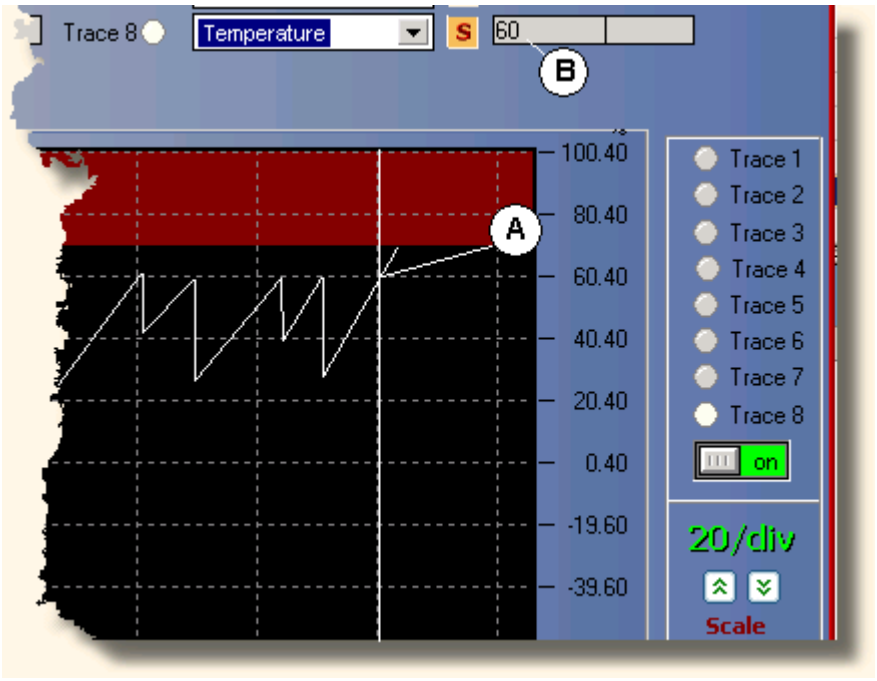


Trace Control

All the Trace setting described above can also be done from one dialog box discussed in the previous section.

3.7.2.5 Cursor Readings

Placing the mouse pointer within the Plot display creates a vertical line cursor. At the points where the cursor intersects, (A) the traces indicates the variable value at that point in time and is reported in a box to the right of the Trace list box, (B). The figure *Plot Cursor*, below, show the cursor intersecting the trace at 60.00 ("X" axes) and this intersecting point value is displayed in the box for Trace 8, variable "Temperature", note that this value corresponds to the grid marking. If other traces intersected this cursor, they too would have variable values reported based on their own scale.



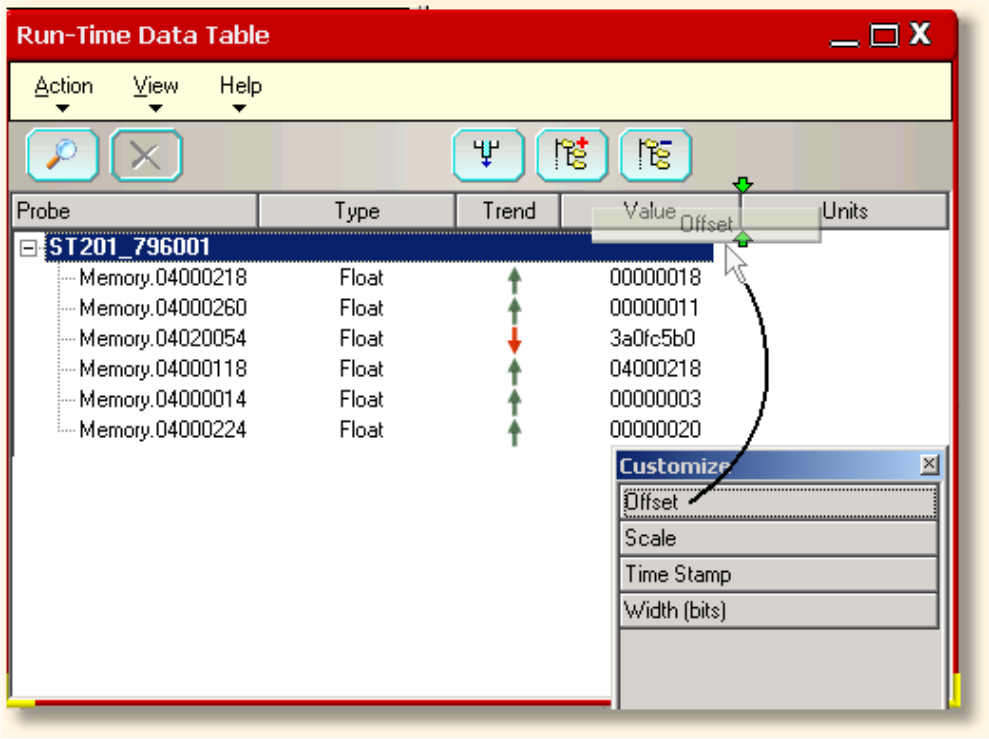
Plot Cursor

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3.7.3 RunTime Data Table

The RunTime Data Table shown in the figure *RunTime Data Table Window* is used to display the value of variable Events while the Module is monitoring the target. RunTime Data is completely non-intrusive and allows the target to run at full speed without interruption. Use the RunTime Data Table to watch variables while the target code or bus operations are running. If a variable's event has not yet occurred, an invalid value (usually zero) will be displayed.

The update interval is 1.0 seconds. If a variable value continues to increase through several up data intervals, an up arrow is displayed in the Trend column. A decreasing variable value trend is indicated in the same manner with a down arrow.

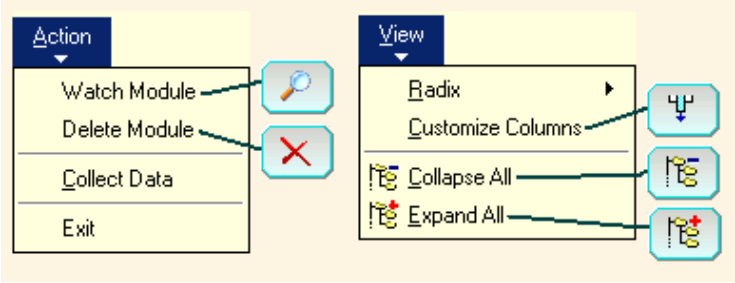


RunTime Data Table Window

Open this window by selecting from the Control Console menu bar, select "Tool Box" | "Standard Tools" | "RunTime Data Table".

Run-Time Data Table Menu Items

The figure below *Run-Time Data Table Menus* shows the correlation between the menu selections and the speed buttons.



Run-Time Data Table Menus

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The function of each menu item and its corresponding speed button is as follows:

Action

Watch Module -- Initializes the monitor and opens a list of active SystemTrace Resources to choose from.
Delete Module -- Removes the highlighted Module from the Run-Time Data Table display.
Collect Data -- When checked, Data in the Display continuously updates, and freezes when unchecked.
Exit -- Terminates the Run-Time Data Table.

View

Radix -- Provides a selection of: Hex, Decimal, Unscaled Decimal, Binary, Octal for the data display.
Customize Columns – See "Other Options" below.
Collapse All -- Hides child items within the parent row.
Expand All -- Makes hidden child items within a row visible.

What To Do
From the RunTime Data Table's menu bar select "Action" then "Watch Module". Select the Module (Resource) to display Data Items (variables) as they are monitored (in real time) by the SystemTrace.
Click on the ⊞ to expand the variables displayed.

Other Options
Columns can be added or removed from the window by selecting "View" from the menu bar and "Customize Columns" from its sub-menu. The "Customize " sub-window will appear as shown in the figure *RunTime Data Table* above. Column Items may be dragged to and from this window. The small green arrows indicate the position the dragged in column will take. The figure above shows the "Offset" item being dragged from the sub-window to a position between the "Value" and "Units" columns.

3.7.4 RunTime Statistics

The Statistics mode is used to provide a statistical analysis of bus activities. The figure below, *Statistic Window* shows the bus Statistics window. The rows list the statistical item and the columns report their values within temporal parameters. The four columns report the following:

Sample Count: shows actual number of occurrences of each statistical item within the set sample period. These measurements are updated at the end of each sample period.

Sample %: shows the percentage of the total possible within the sample period for each statistical item. These measurements are updated at the end of each sample period.

Total Count: shows actual number of occurrences of each statistical item since the Monitor was started.

Total %: shows the percentage of the total possible for each statistical item since the Monitor was started.

Run-Time Statistics Menu Items
The function of each menu item is as follows:

Action

Watch Module -- Initializes the monitor and opens a list of active SystemTrace Resources to choose from.

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Delete Module -- Removes the highlighted Module from the Run-Time Data Table display.

Exit --Terminates the Run-Time Data Table.

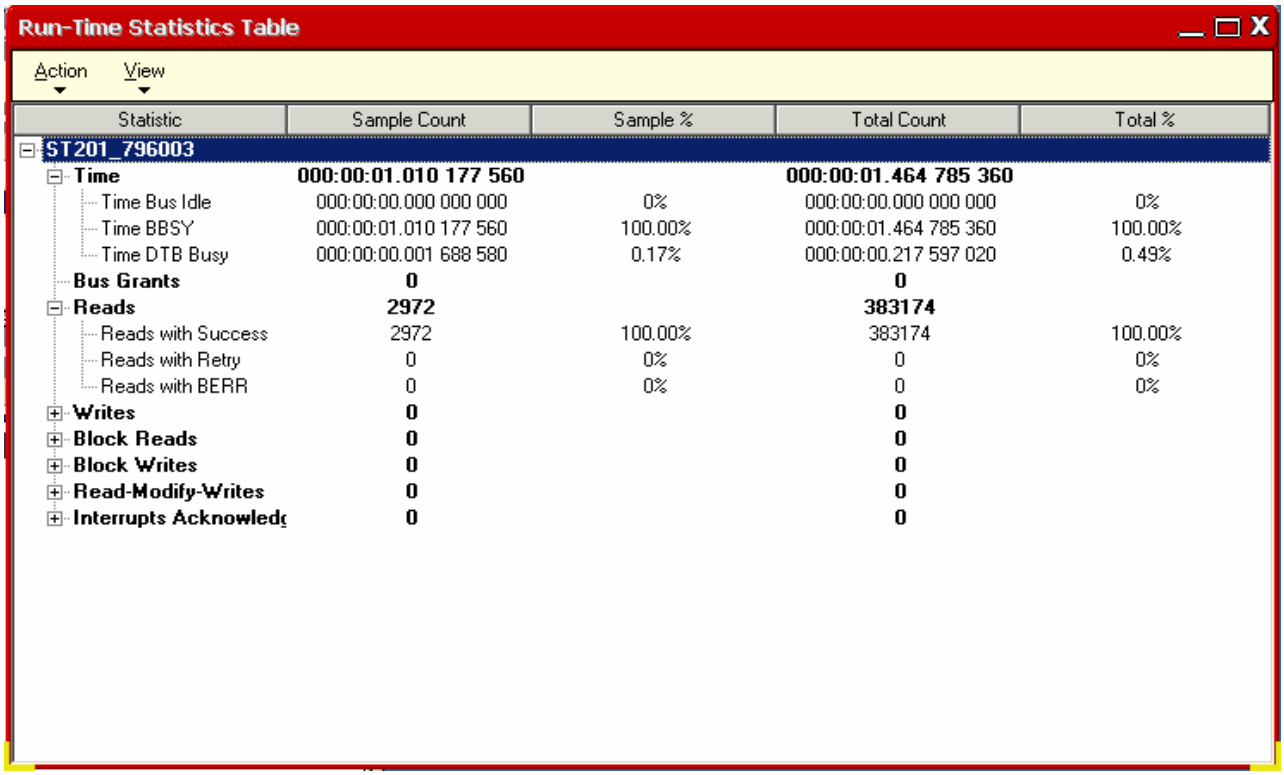
View

Customize Columns – See "Other Options" below.

Collapse All -- Hides child items within the parent row.

Expand All -- Makes hidden child items within a row visible.

What To Do
While the Monitor is running, select "Tool Box" from the Control Console menu bar then "Standard Tools" | "RunTime Statistics". Click on the ⊞ to view details of the statistics.



Statistic Window

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Part



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4 Utilites

4.1 Auto Symbol Translation

SystemTrace™ Auto Symbol Translation is a method of importing Symbol File information from a user generated text file into a SystemTrace™ Symbol Table. This provides a symbol table for the user to select from when specifying Events for collection by the SystemTrace™ Monitor. The SystemTrace™ AST File user manual explains this format. If custom file converters are supplied, a user manual will accompany that AST utility. Access the default file import in the Symbol Editor.

4.2 BOOTp

BOOTP Server Window:
This dialog window is for setting the network attributes of a Resource. The network administrator will need to be consulted to fill in the required information in this dialog. This procedure is required when installing a new Resource or reconfiguration of the network or changing the IP address of an existing Resource.

The "Resource MAC Address" field must be filled in and at least one of the remaining three fields before clicking the OK button. Upon success the message "Server terminated -- new parameters sent to SystemTrace Resource" is presented.

Resource MAC Address: Media Access Control
Entry always required.
Found on Resource as explained in the Installation section.

Internet Protocol Address:
Resource's network address. Be sure the IP address you assign is unique. There is no warning or error message if you duplicate this address.
Entry required if none in "New Default Gateway" or "New Subnet Mask"

New Default Gateway:
Gateway address is default if left blank.
Entry required if none in "New IP Address" or "New Subnet Mask"

New Subnet Mask:
Entry required if none in "New Default Gateway" or "New IP Address"

Also see the Installation chapter Network Configurations section.

4.3 WS_UTIL

Description

WS_UTIL is an application that closely resembles an FTP client program. It is a command line program that runs under a Command Prompt. It provides a means to communicate and transfer files with the Module Embedded Processor Card. It is intended for use in the maintenance and troubleshooting of SystemTrace™ Modules.

Operation

When starting WS_UTIL, you must know the Module's IP address. If you do not know this parameter, consult your network administrator.

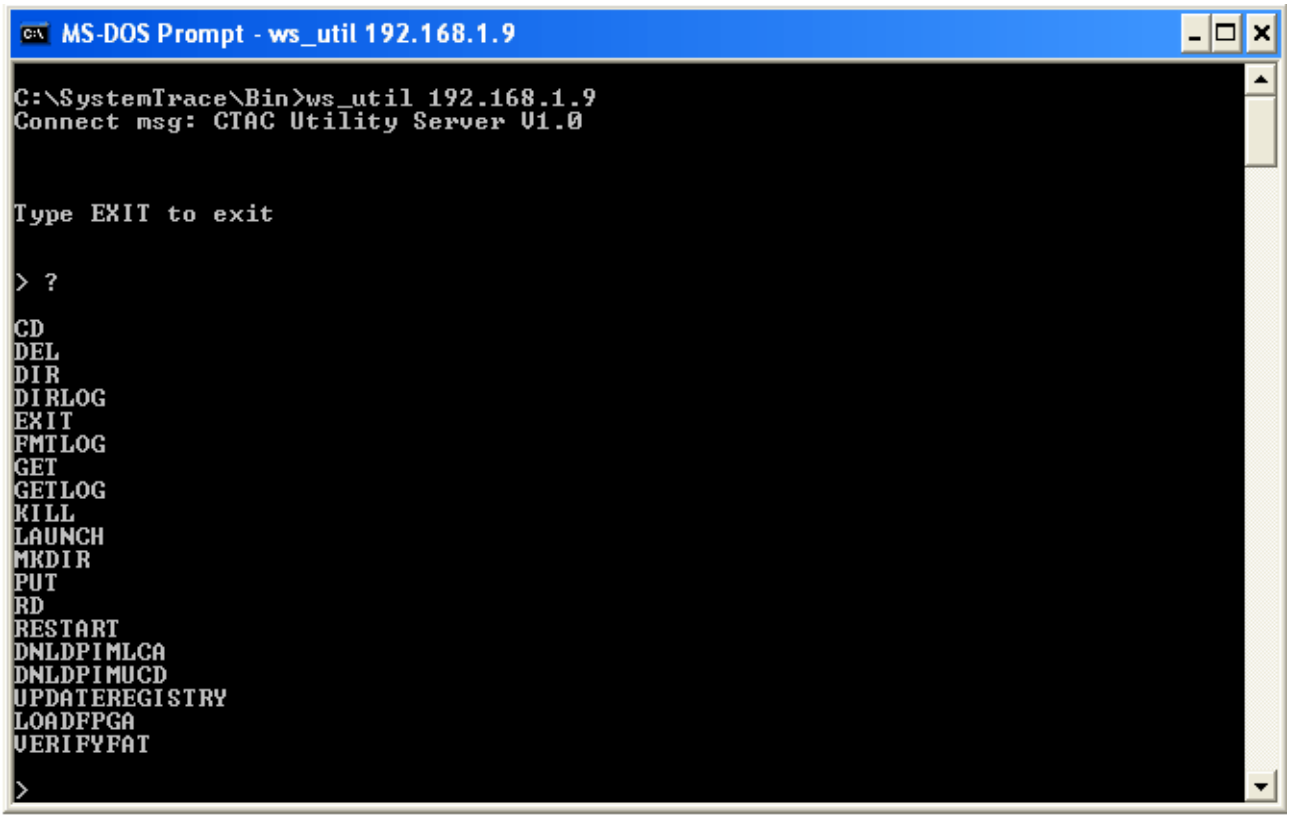
Starting WS_UTIL

To start the WS_UTIL program, enter a DOS/ Command Prompt window and go to the SystemTrace™ installation directory, then go in the sub-directory 'Bin'. To invoke the application, type

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'WS_UTIL' followed by the IP address of the desired Module. To access a list of valid commands, enter '?'. See the figure ***WS_UTIL.EXE*** as an example.



WS_UTIL.EXE Command Listing

Changing the Resource/ Module Name

To modify the Module's Probe Name, the Module's **ctac.reg** file must be accessed and the Module's 'Probe Name' name field edited.
To modify the Module ctac.reg file, it is transferred to the workstation using WS_UTIL, modified, then transferred back to the Module. To accomplish this, do the following:
Start WS_UTIL from the SystemTrace™ Workstation by opening a DOS window and changing to the C:\ITCN\SystemTrace\BIN directory.
1. From the DOS prompt, type: WS_UTIL ph_name. Where ph_name is an IP host name or dotted decimal IP address of the Module with which to communicated.
WS_UTIL responds with a ">" prompt.
2. Type "kill all" at the WS_UTIL prompt. This shuts down the SystemTrace™ server application on the Module.
3. Type "get ctac.reg" at the WS_UTIL prompt. Wait for the WS_UTIL prompt to reappear.
4. Use Notepad to edit c:\SystemTrace\bin\ctac.reg. Search for the Probe Name field in the file. Change the name to the new name. Be sure to preserve the double quotes in the field. Save the file on the Workstation.
5. Switch back to the WS_UTIL DOS window. At the WS_UTIL prompt type "put ctac.reg". This replaces the old file with the new, edited file. Wait for the WS_UTIL prompt to reappear.
6. At the WS_UTIL prompt, type "updateregistry ctac.reg" to make the Module aware of the change and then cycle power on the Module. Then type, "restart".
7. Type "exit" at the DOS prompt to close the DOS window.
Launch the SystemTrace™ GUI program. The Available Probes section should now include the new Probe name.

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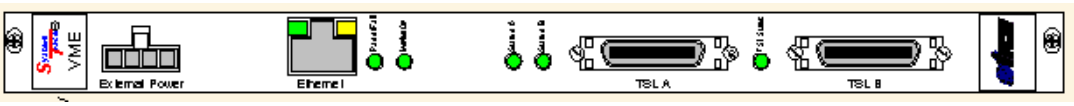
Part V

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5 VME Module

5.1 Module Chapter Introduction

This chapter covers the SystemTrace VME Module functions and features. Utilization of the features are demonstrated in the "**What To Do**" sections.
Terms and words used in this manual that are related to SystemTrace attributes are capitalized to distinguish them from their generic uses.



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5.2 VME Module Overview

5.2.1 Physical

The VME Module board assembly is a double height (6U x 4HP) single width package with board ejector handles. When installed in a vibration isolated, cooled chassis the VME Module is flyable. Several connectors and indicator lights are available on the front panel as shown in the figure *VME Module*. Their functions are as follows:

1. External Power Plug for receiving power of +5 volts and ground. See figure *External Power Plug* below.

2. 00 BaseT Ethernet connector for Module to Module TCP/IP communications.

3. Initialization Status LED. (Green = Ready, Amber = Not Initialized).

4. Monitor Status LED. When this LED is illuminated the Monitor is actively. collecting data or waiting for an event to occur.

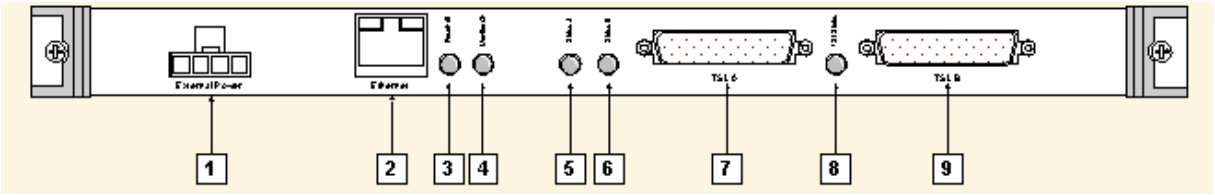
5. Status A LED, Module Allocation. Green = Allocated, Amber = Not-Allocated.

6. Status B LED, (Reserved).

7. RS482 Connector. Input from another Module, for time synchronization and external trigger events.

8. Module Sync Status LED. Green = Module is synchronized with other Modules in the group and the Time Master Module is established. Amber = Synchronization not complete due to the following: Sync still in process, there are no other Modules to sync with, other Modules in the group already monitoring, or a failure has occurred.

9. RS482 Connector. Output to another Module, for time synchronization and external trigger events.



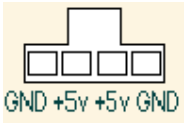
VME Module

The VME Module is designed to plug into any 6U single VME card slot. The VME Module board is equipped with hard jumpers to configure the Module as System Controller upon installation of additional firmware. The installation of flying leads to the user I/O pins on the Module slot fanning out to each VME slot enables monitoring of the VME Bus Grant signal and identification of bus masters in the monitor records. (Contact ITCN for information about these enhancements).

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The VME Module card receives power from the VME backplane; it is also capable of receiving power externally. To use external power the on board switch SW1 must be set to "External Power".



External Power Plug

5.2.2 Environmental Requirements

Operation Temperature	50º F to 95º F	10º C to 35º C
Storage Temperature	40º F to 104º F	4º C To 40º C
Relative Humidity (non-condensing)	10% to 85%	

5.2.3 Power Supply Specifications

Voltage	+5 Volts DC
Current	5 Amps (nom), 40 W (max)
Power	25 Watts (nom), 40 Watts (max)
Ripple and Noise	+/- 1%pp (max)
Tolerance	+/- 5%

5.3 VME Module Capabilities

5.3.1 Bus Monitoring

The VME Module is capable of monitoring and recording activity on all four VME backplane buses (Data Transfer Bus (DTB), Arbitration Bus, Interrupt Bus, and Utility Bus). This allows the analysis of data transfers between processors, or any other device that participates in data transfers and VME bus arbitration. With the VME Module the mechanisms of the VME bus itself can be analyzed by specifying occurrences on the Arbitration, Utility and Interrupt Busses as Events for the Module to monitor and record. Any specific occurrences or group of occurrences on the bus may be recorded by setting up the Module to identify them as Events and selecting the Record Action. Conditions as to when the event should be recorded may be setup by the user, such as, number of Event occurrences, elapsed time, or a dependence on the occurrence of other Events. An Event may be designated as a triggering point for a recording. The recording may be delayed from the trigger point to provide the desired proportions of pre and post Trigger data. Activity on the Data Transfer Bus may be recorded as a Range Event or a Variable Event. Activity on the Utility, Interrupt, and Arbitration buses are recorded as predefined Special Events.

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5.3.2 Software Instrumentation

The VME Module is capable of monitoring and recording activity generated by Software Instrumentation. The VME Module supports STsi. Refer to the STsi section for details on using the STsi features.

5.4 VME Events

In this section VME Event specifications will be explained starting with the Data Item Symbol category and its associated VME Event Properties. The Range Symbol category will be covered in the following section. Other general Event specifications are explained in the Session Editor sections.

5.4.1 Symbol Categories

The VME Module only has two Symbol sections: Memory and STsi. The Memory section supports two catagories: Range and Data Item. The STsi section supports catagories for Processors, Procedures, and Data Items. These Symbol sections and catagories are discussed more extensively in the Symbol Editor and STsi sections of this users guide.

5.4.1.1 Memory Symbols

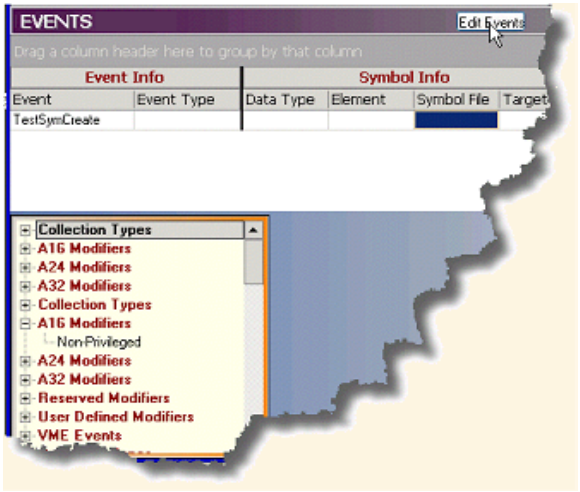
Memory Symbols represent VME backplane memory addresses. Use this section to define data transactions across the VME backplane.

5.4.1.1.1 Data Item

General Data Item Event properties are covered in the Event Editor and Symbol Editor sections. This section describes VME specific Event properties setup.

5.4.1.1.1.1 Data Item Event Properties

From the Event Pane of the Session Editor window, additional details may be added to the Event definition to provide a narrow set of circumstances in which SystemTrace will recognize the Event. Clicking on the "Edit Event" button shown in figure *Event Pane* will open a selection of Event properties shown in the figure and described in Table 2



Event Pane

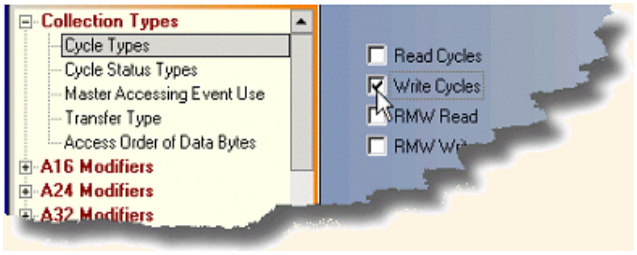
A Symbol File should already be assigned to the Module at this point indicated by the Symbol File name in the Session Modules

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window Symbol File Column. If this is not the case, see the Event Editor section.

What To Do
Click on the "Edit Event" tab and click on the ⊞ next to the desired item in the list. The example in figure *Expanded Event Property Item*, shows "Collection Types" expanded and the "Write Cycles" box checked in the check box dialog to the right or the Event properties list.



Expanded Event Property Item

Why
The Symbol that is put in the Event list only specifies what the Event is, addresses and types of data. Setting the properties defines how the Event occurs. As shown in figure *Expanded Event Property Item* we only want SystemTrace to react when the Event occurs as a Write Cycle, this forms sort of a sub-set Event of which consist only of Write Cycle Events.

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5.4.1.1.2 Range

Range Symbols are associated with contiguous words of memory in the target. The range can be an array of data or a set of operational program instructions. Range Symbols require an entry for, Name, Min Address, Max Address and Cycle Type in the dialog window.

5.4.1.1.2.1 Range Event Properties

This section elaborates on the Events describing the VME bus activities that can be defined. The items listed below make up a Range Event Specification. Items preceded with " [R] " supper script must be defined/selected in all cases to complete a Range Event Specification. The remaining items can be left at default or are dependent on other selections. The first three items were set when the Symbol was defined.
The remaining items are setup through the Edit Event pane accessible by clicking on Edit Event button in the Events pane of the Session Editor window.

1. [R]Event Name, ASCII string
2. [R]Minimum Address, (min max address required on Range Events only)
3. [R]Maximum Address, (min max address required on Range Events only)
4. Address Modifiers, A16, A24, A32, User Defined, and Reserved.
5. Master Accessing the Event Used , (BR0, BR1, BR2 or BR3).
6. [R]Cycle Types, One or more of (Read, Write, Read during RMW, Write during RMW, Address Only)
7. Cycle Status Types, One or more of (Success, Retry, Bus Error)

A Symbol File should already be assigned to the Module at this point indicated by the Symbol File name in the Session Editor window Symbol File Column. If this is not the case, see the Symbol Editor chapter.

What To Do
With the Symbol in the Event List, click on the Edit Event tab at the top of Module's Events pane and select an event properties. The Event properties covers cycles on the Data Transfer Bus (DTB). Check all the boxes that describe the VME DTB cycles to be recorded

Why
The menu list and boxes indicate details of the VME bus status and DTB cycle type that make up the event to be captured within the Symbol's defined address Range. The other selections on the list are explained in the "Data Item Event Properties" section of this users guide.
Default Event Properties

5.4.1.2 STsi Symbols

STsi Symbols represent execution in the user's intrumented source code running on a processor in the VME chassis. These Events are written across the VME backplane to memory addresses in the SystemTrace VME board. Use this section to define Symbols for instrumenting your application. The STsi section explains the use of these Symbols in detail.

5.4.1.2.1 Data Item Symbols

STsi Data Items are used to trace program variables in user instrumented code.

5.4.1.2.2 Procedure Symbols

STsi Procedure Symbols are used to trace program execution timing in user instrumented code.

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5.4.1.3 Default Event Properties

SystemTrace Symbols and Events may be programmed with specific properties. These properties are available to the user in the Symbol Editor under DEFAULT EVENT PROPERTIES and in the Session Manager under EVENT PROPERTIES. The settings entered in the Symbol Set will become the default. These properties will be included with the symbol each time it is added to the Event List.

Event Properties	Description
Address Modifiers	One or more 6 bit Address Modifiers. Selected : A32, A24, A16 Modifiers, User Defined Modifiers, or Reserved. These selections are shown in figure Module's Event Pane
Access Order	Whether masters will access various parts of the variable: from high address to low address, or, from low address to high address.
Cycle Types	One or more of selections: Read Cycles, Writes Cycles, Reads During RMW, Writes During RMW.
Cycle Status Types	One or more of selections: Success, Retry, Bus Error. These selections are available under the Collection Types
Master Accessing	Bus Request lines involved in Events. One or more of selections: Bus Request 0, Bus Request 1, Bus Request 2, Bus Request 3 These selections are available under the Collection Types " Master Accessing Event Used"
Transfer Types	Types of masters that will be accessing this variable. One or more of selections: D08, D16, D32. These selections are available under the Collection Types

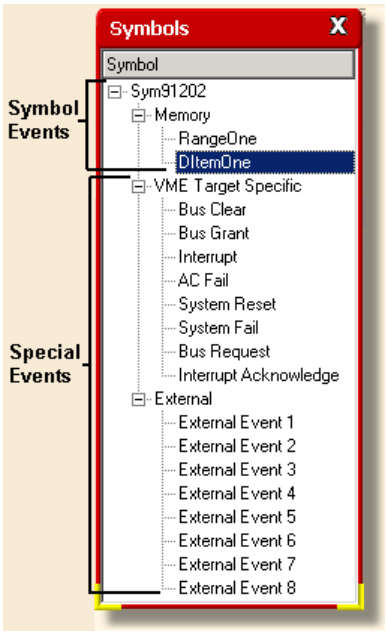
Table VME Data Item Event Properties

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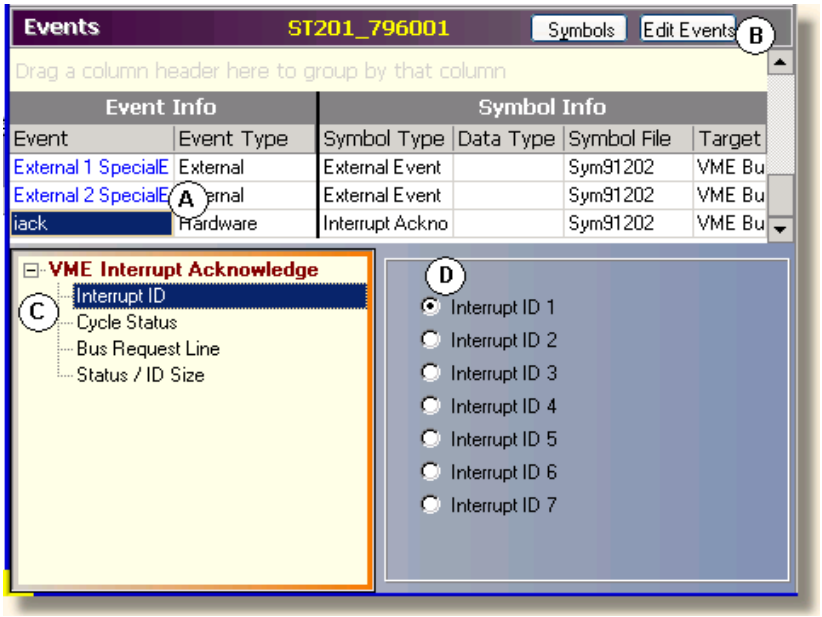
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5.4.2 VME Special Events

The Special Events can be added to the Event List The menu shown in the figure *Special Events List* will present VME items on the described in the following tables. The External Events are explained in the Session Editor, External Events section of this users guide



Special Events List



Special Event Setup

What To Do
Refer to the Special Events Setup figure above for the following explanation of VME Special Event Setup details.

Select a VME bus Event from the Symbol window shown in the Special Event List figure and drag it

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to the Event column (A).
Open the Edit Event pane (C) by clicking on the Edit Events button (B).
Expand the item in the Edit Event pane (C) by clicking on the ⊞ box; (C) Shows "VME Interrupt Acknowledge" expanded in this way.
Further define the VME Special Event by selected each item in the tree (C) and selecting its parameters in the pane to the right (D).

Why
The process above is used to define each of the Special Events shown in the figure *Special Event List* to define characteristics of the VME bus activities and capture their occurrence.

Other Options
Special Events already defined and in the Event pane may be Edited by highlighting the Event in the Event pane and then clicking the Edit Event button and following the What To Do procedure above.
All of the VME Special Event and their parameters are explained in the sections that follow.

5.4.2.1 Bus Clear

A Bus Clear Event may be defined and added to the Event Pane with the following Event properties selected.

Symbol Name, Event Properties	Bus Clear See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string – Name associated with a state change in the VME Bus Clear line. (Defined in the Edit Event pane)

Table Bus Clear Event Specification

5.4.2.2 Bus Request

A Bus Request Event may be defined and added to the Event List with the following Event properties selected.

Symbol Name, Event Properties	Bus Request See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string – Name associated with a state change on any of the selected Bus Request lines. (Defined in the Special Event Bus Request dialog box)
Bus Requester	Identifier of Bus Request Line that changed (0 – 3). Select one or more.

Table Bus Request Event Specification

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5.4.2.3 Bus Grant

A Bus Grant Event may be defined and added to the Event List with the following Event properties selected.

Symbol Name *Event Properties*	Bus Grant See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string – Name associated with a change in state on any of the selected Bus Grant lines as a result of any master issuing a Bus Request. (Defined in the Special Event Bus Grant dialog box)
Grant Line	Identifier of Bus Grant line (0 – 3) "Bus Grant Line". Select one or more.
Master Accessing Event Used	Identifier of the BR line (BR0-BR3) the master used to grant the bus in this Event. Select one or more.

Table Bus Grant Event Specification

5.4.2.4 Interrupt

Interrupt Event may be defined and added to the Event List with the following Event properties selected.

Symbol Name *Event Properties*	Interrupt See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string – Name associated with a state change in any of the Interrupt Request lines. (Defined in the Special Event Interrupt dialog box)
Interrupt Request Line	Identifier of the Interrupt Request Line that changed (1 – 7) "Interrupt ID". Select one or more.

Table Interrupt Event Specification

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5.4.2.5 Interrupt Acknowledge

Interrupt Acknowledge Event may be defined and added to the Event List with the following Event properties selected.

Symbol Name *Event Properties*	Interrupt Acknowledge See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string – Name associated with any hardware event that meets this specification (Defined in the Special Event Interrupt Acknowledge dialog box)
Interrupt Line ID	This is one of seven lines used to request an interrupt. "Interrupt ID". Select only one.
Bus Request	Identifier of Bus Request Line that changed (0-3) "Bus Request Line". Select one or more.
Status/Id Size	One or more of selections: D8, D16, or D32 bits "Status/ID Size". Select one or more.
Cycle Status	Whether Interrupter asserted BERR "Cycle Status". Select one or both.

Table Interrupt Acknowledge Cycle Event Specification

5.4.2.6 AC Fail

AC Fail Event may be defined and added to the Event List with the following Event properties selected.

Symbol Name *Event Properties*	AC Fail See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string - Name associated with any hardware event that meets this specification.

Table AC Fail Event Specification

5.4.2.7 System Reset

System Reset Event may be defined and added to the Event List with the following Event properties selected.

Symbol Name *Event Properties*	System Reset See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string – Name associated with any hardware event that meets this specification.

Table System Reset Event Specification

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5.4.2.8 System Fail

System Fail Event may be defined and added to the Event List with the following Event properties selected.

Symbol Name, Event Properties	System Fail See Section "VME Special Events", figure "Special Events List" Also see Symbol Editor chapter
Event Name	ASCII string – Name associated with any hardware event that meets this specification.

Table System Fail Event Specification

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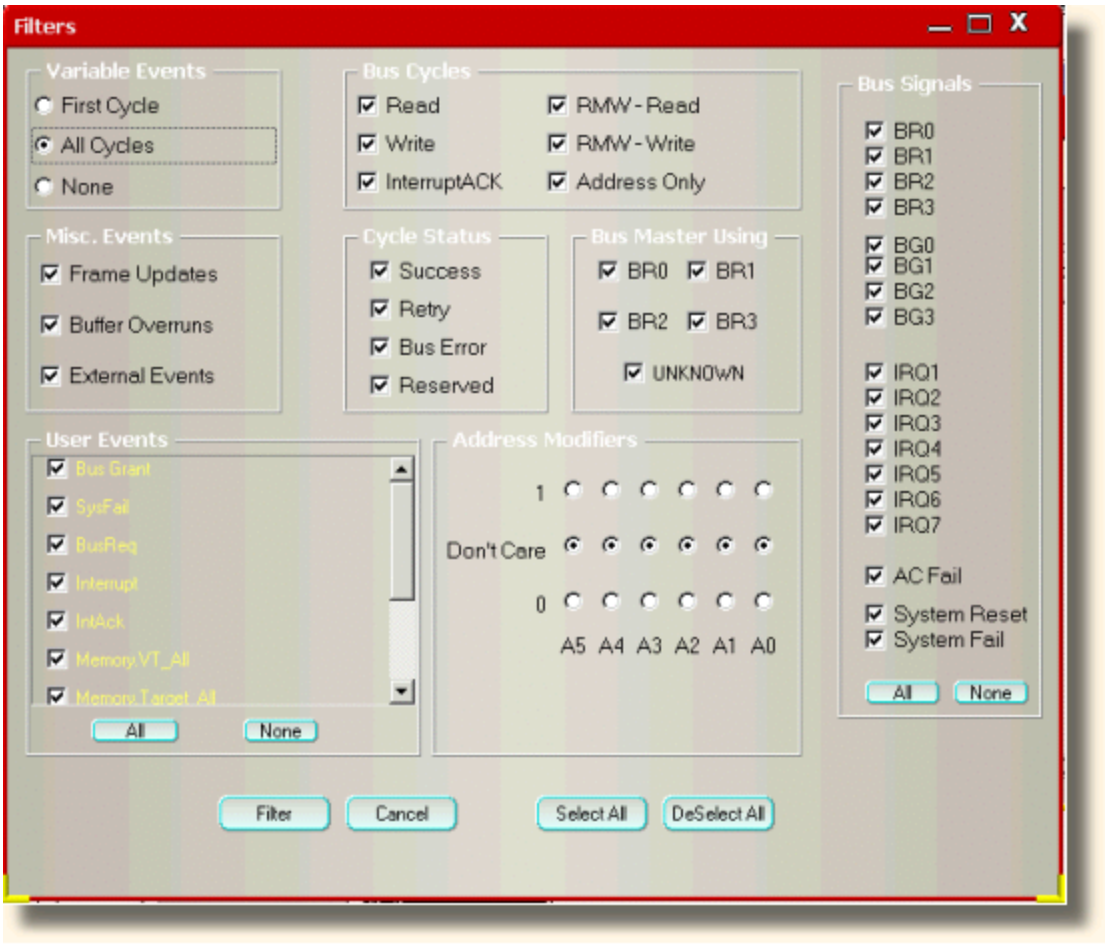
Part VI

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6 VME Analysis

6.1 VME Event Table Features

SystemTrace provides an analysis program to display collected data filtered and formatted to the user's observational goals. The Analysis section should be consulted to understand its general uses and functions. The Analysis section in the VME Module part explains Analysis features specific to VME Module data collection.
The Display Filter dialog box is used to tailor the collected VME data presentation in the Event Table presentation. The VME Display Filter dialog window is divided into sections shown in the figure *VME Display Filters*. An explanation of each section follows.



VME Display Filters

What To Do
Select the desired item in the filter window shown above then click the Filter button.
Exit the window by clicking on the ✕ and accept the selections.
Click the Cancel button to undo any changes.

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6.1.1 Variable Events

"First Cycle Only", display first access of the bus only and none of the subsequent accesses associated with a data transfer that requires multiple bus cycles to be complete.
"All", display all access of the bus associated with a data transfer that requires multiple bus cycles to be complete.
"None" may be checked to exclude all Variable Events from the Event Table.

6.1.2 Misc. Events

"Frame Updates", "Buffer Overruns", "Ancillary Events", and "External Events" are all covered in the Post Run Analysis section. Check any combination in this section to include their occurrences in the Event Table.

6.1.3 User Events

"User Events" are the Events defined by the user in the Session Setup, before the test is run. Checking the box next to the Event name selects its occurrence for display in the Event Table.

6.1.4 Bus Cycle

"Bus Cycle" allows the user to put a finer point on the type of Events to be observed. For example, the user may wish to look at only reads within a Range Event (address range). Checking only the Read box in the dialog window would exclude writes or any other operation from the Range Event from being displayed.

6.1.5 Cycle Status

"Cycle Status" is reported in Event Table under a column of the same name ("Cycle Status"). These selections allow the user to choose to observe bus transfer success, failure and retry occurrences.

6.1.6 Bus Masters

"Bus Masters using" BR (Bus Request lines)- 0, 1, 2 or 3 is reported in a Event Table column "Master ID." These selections will include an identification of the Bus Master and Bus Request line involved with the bus transaction recorded in the Trace and History Record.

6.1.7 Bus Signal

"Bus Signals" selections allow the user to select an individual or a combination of VME bus control signals to be part of the Event Table. The occurrences of these signals are reported in the "Cycle Type" column of the Event Table. An explanation of the Bus Signals is provided in the "VME Special Events" section of this chapter.

6.1.8 Address Modifiers

"Address Modifiers" are reported under the "A0-A5" column in the Event Table. These selections allow the user to define an Address Modifier bit pattern to be included in the Event Table. The "1" to the left of the first row of radio buttons indicate the bits that must be high for the record to be included in the display. The "dc" to the left of the second row are don't care bit selections. The "0" to the left of the third row are bits that must be low within the record's Address Modifier to be displayed.

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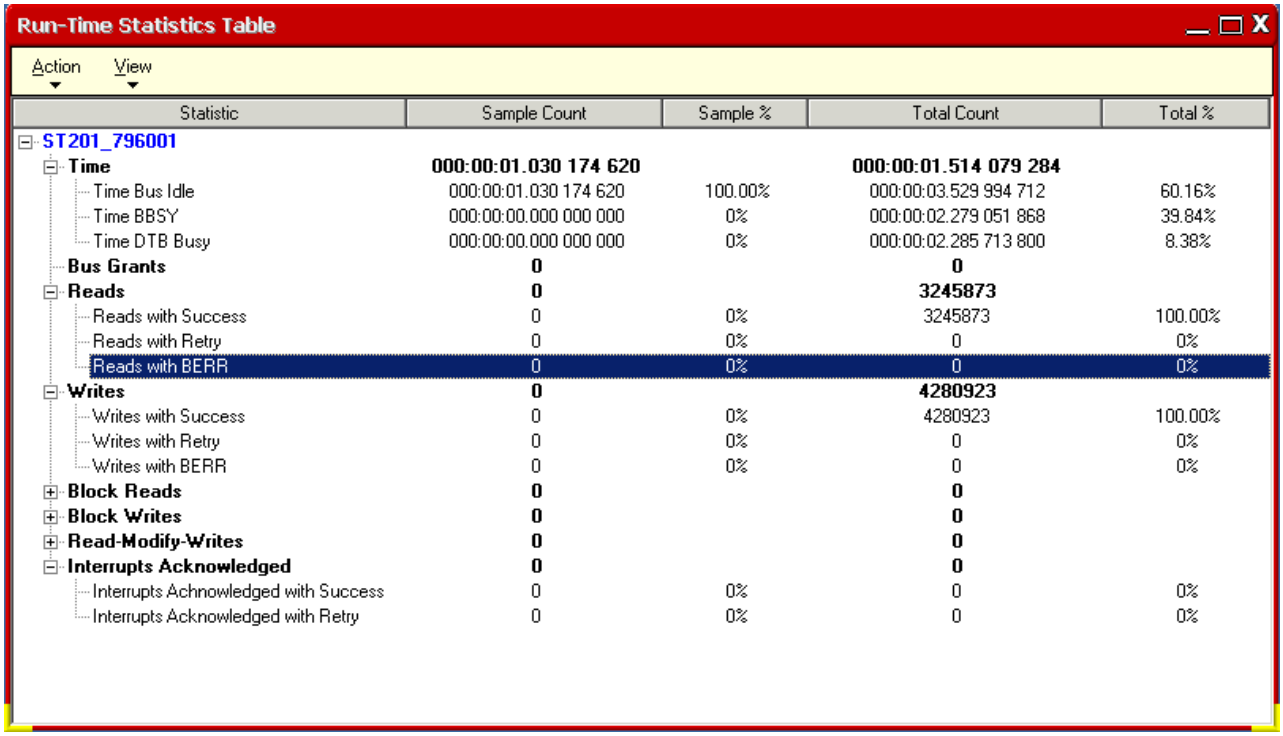
6.2 Bus Statistics

The Bus Statistics mode is used to display VME bus statistics while the Module is monitoring the bus. A Module is monitoring when its row in the Session pane Monitor Status column displays "On", or the Session name is in inverted colors.

What To Do
To display bus statistics, select "Tool Box" from the Control Console menu bar, "Standard Tools" | "RunTime Statistics" from the drop-down menu.

6.2.1 Reading Statistics

The Statistics mode is used to provide a statistical analysis of the VME bus activities. The figure *Statistic Window* shows the SystemTrace VME bus Statistics window. The rows list the statistical item and the columns report their values within temporal parameters. The four columns report the following:
Sample Count: shows actual number of occurrences of each statistical item within the set sample period. These measurements are updated at the end of each sample period.
Sample %: shows the percentage of the total possible within the sample period for each statistical item. These measurements are updated at the end of each sample period.
Total Count: shows actual number of occurrences of each statistical item since the Monitor was started.
Total %: shows the percentage of the total possible for each statistical item since the Monitor was started.



Statistic	Sample Count	Sample %	Total Count	Total %
ST201_796001				
Time	**000:00:01.030 174 620**		**000:00:01.514 079 284**	
Time Bus Idle	000:00:01.030 174 620	100.00%	000:00:03.529 994 712	60.16%
Time BBSY	000:00:00.000 000 000	0%	000:00:02.279 051 868	39.84%
Time DTB Busy	000:00:00.000 000 000	0%	000:00:02.285 713 800	8.38%
Bus Grants	**0**		**0**	
Reads	**0**		**3245873**	
Reads with Success	0	0%	3245873	100.00%
Reads with Retry	0	0%	0	0%
Reads with BERR	0	0%	0	0%
Writes	**0**		**4280923**	
Writes with Success	0	0%	4280923	100.00%
Writes with Retry	0	0%	0	0%
Writes with BERR	0	0%	0	0%
Block Reads	**0**		**0**	
Block Writes	**0**		**0**	
Read-Modify-Writes	**0**		**0**	
Interrupts Acknowledged	**0**		**0**	
Interrupts Achnowledged with Success	0	0%	0	0%
Interrupts Acknowledged with Retry	0	0%	0	0%

Statistics Window

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7 VME Address Modifiers

AM	Function
0x3F	A24 supervisory block transfer (BLT)
0x3E	A24 supervisory program access
0x3D	A24 supervisory data access
0x3C	A24 supervisory 64-bit block transfer (MBLT)
0x3B	A24 non privileged block transfer (BLT)
0x3A	A24 non privileged program access
0x39	A24 non privileged data access
0x38	A24 non privileged 64-bit block transfer (MBLT)
0x37	A40BLT
0x35	A40 lock command (LCK)
0x34	A40 access
0x32	A24 lock command(LCK)
0x2F	Configuration ROM/Control&Status Register (CR/CSR)
0x2D	A16 supervisory access
0x2C	A16 lock command (LCK)
0x29	A16 non privileged access
0x21	2e VME 3U
0x20	2e VME 6U
0xF	A32 supervisory block transfer (BLT)
0xE	A32 supervisory program access
0xD	A32 supervisory data access
0xC	A32 supervisory 64-bit block transfer (MBLT)
0xB	A32 non privileged block transfer (BLT)
0xA	A32 non privileged program access
0x9	A32 non privileged data access
0x8	A32 non privileged 64-bit block transfer (MBLT)
0x5	A32 lock command (LCK)
0x4	A64 lock command (LCK)
0x3	A64 block transfer (BLT)
0x1	A64 single transfer access
0x0	A64 64-bit block transfer (MBLT)

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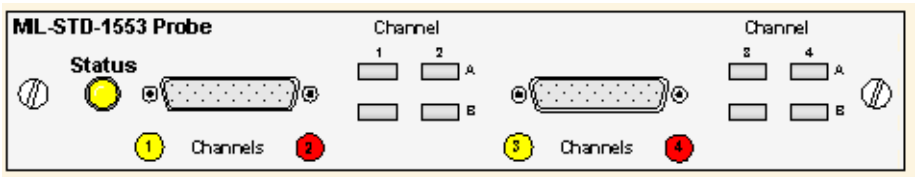
Part VIII

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8 1553 Probe

8.1 Probe Chapter Introduction

This chapter covers the SystemTrace 1553 Module functions and features. Utilization of the features are demonstrated in the "**What To Do**" sections. Terms and words used in this manual that are related to SystemTrace attributes are capitalized to distinguish them from their generic uses.



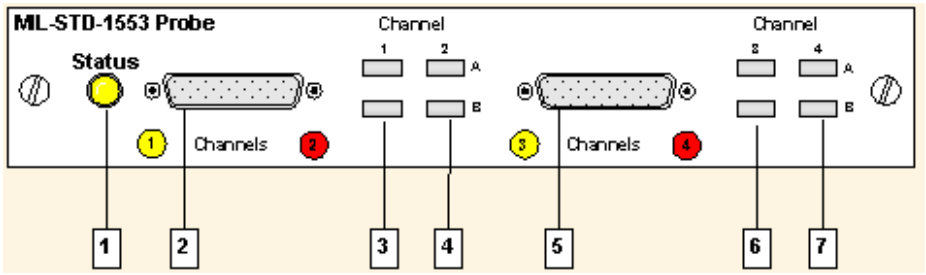
1553 Probe Front Panel

30303

8.2 1553 Probe Overview

8.2.1 Physical

The 1553 Probe board assembly is designed to plug into a single Probe slot in the SystemTrace Stand Alone Module chassis. Several connectors and indicator lights are available on the front panel as shown in the figure 1553 Module. Their functions are as follows:



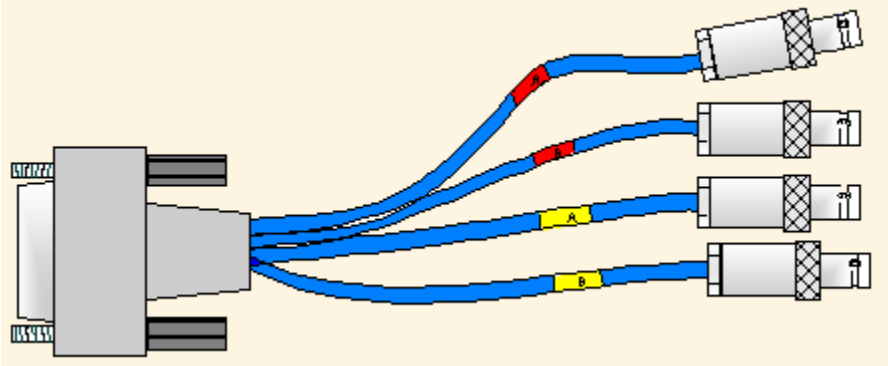
1. Probe Status LED, Green = Probe initialization complete and ready to use, Red = Probe initialization error.
2. Bus connector for Channel 1 A and B and Channel 2 A and B. The figure below shows the mating cable connector.
3. Channel One Bus A and B Status LED. When this LED is illuminated green the Monitor is actively collecting data, if amber a bus error has been detected.
4. Channel 2 Bus A and B Status LED. When this LED is illuminated green the Monitor is actively collecting data, if amber a bus error has been detected.
5. Bus connector for Channel 3 A and B and Channel 4 A and B.
6. Same as item 3, but for Channel 3 and 4.
7. Same as item 4 but for Channel 3 and 4

The 1553 Probes receive power from the Module backplane and attaches to the 1553 bus with the cable shown in the figure below, *1553 Cable Connector*. Each wire has a color band that indicates its

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Channel, red for channels one and three, yellow for Channel 2 and 4. The printed label on each wire indicate the A or B bus connections.



1553 Cable Connector

8.3 1553 Probe Capabilities

8.3.1 Bus Monitoring

Each 1553 Probe is capable of monitoring and recording activity on four Dual Redundant MIL-STD 1553 busses. This allows the analysis of message transfers between the BC and RTs. With the 1553 Probe, the mechanisms of the 1553 bus itself can be analyzed by specifying occurrences on the Bus as Events for the Probe to monitor and record. Any specific occurrences or group of occurrences on the bus may be recorded by setting up the Probe to identify them as Events and selecting the Record Action. Conditions as to when the event should be recorded may be setup by the user, such as, number of Event occurrences, elapsed time, or a dependence on the occurrence of other Events. An Event may be designated as a triggering point for a recording. The recording may be delayed from the trigger point to provide the desired proportions of pre and post Trigger data. Activity on the Bus may be recorded based on the RT, RT Sub-Address and the characteristics of the messages and its Word types. Special Events generated from outside the 1553 bus may also participate in the testing process.

8.4 1553 Events

1553 Events are defined as Symbols which have been inserted into the Event List.

The general use and function of the Symbol Editor is covered in the Symbol Editor Chapter, this portion of the 1553 Probe chapter covers 1553 Symbols only.

The creation of Symbols to monitor bus activity and the elements of the messages transferred requires a hierarchal structure starting with an RT Symbol at the top and stepping down for finer details of the messages transferred.
The RT Symbol is under the Bus section ("Bus "). The RT Symbol and its available child Symbols and their parent child relationship indicated by indentation are as follows:

RT—all other child Symbols below pertain to this RT, e.g. RT-2.

Sub-Address—this is the Sub-Address of the parent Symbol above, e.g. RT-2, Sub Address 3333

Mode Code—a Mode Code of the specified parent RT Symbol above, e.g. MC 18 from RT-2.

Message—the message transfer format involving the parent RT and its Sub-Address above, e.g. RT-2 Sub-Address 3333 Word Count 2 to RT-7.

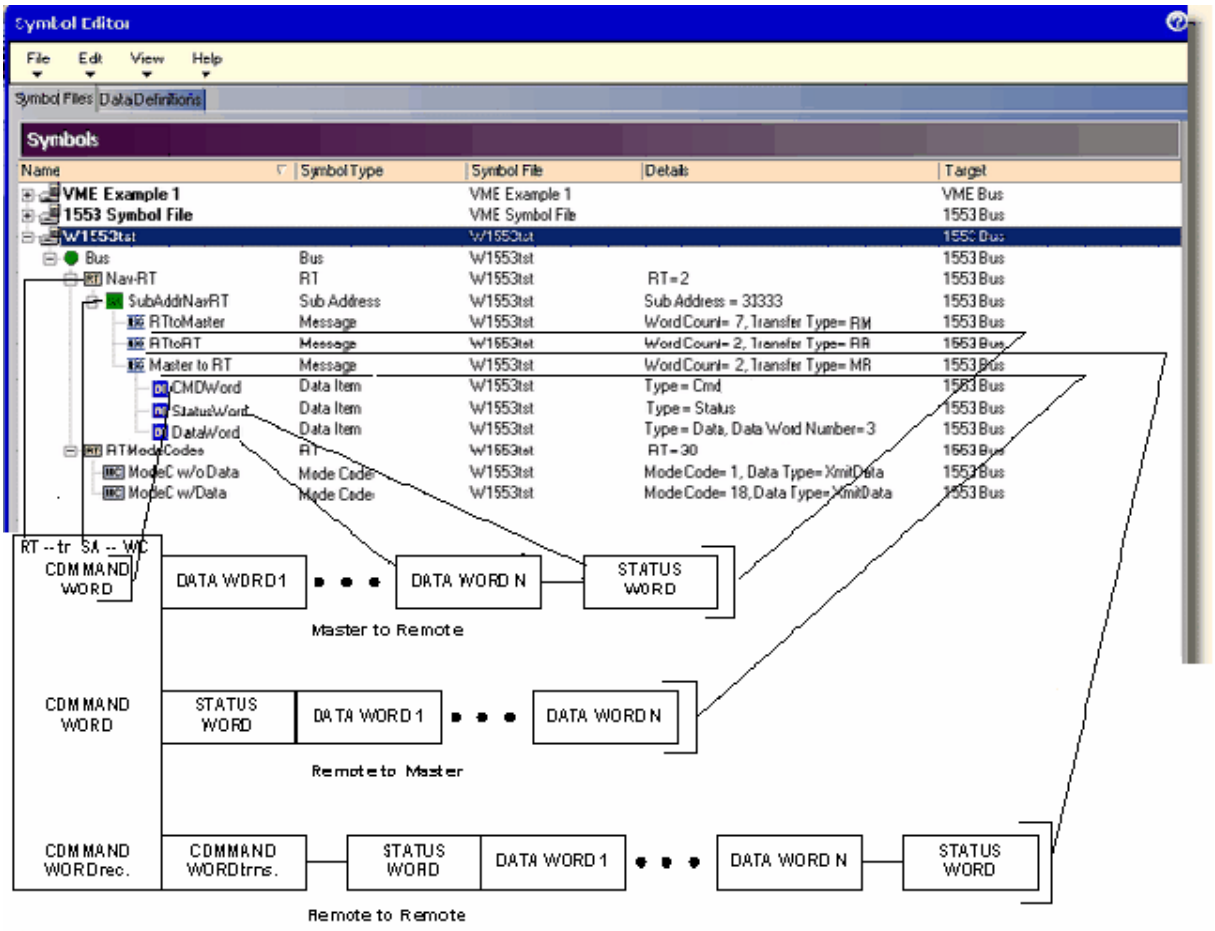
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Data Item—Command, Data or Status Words to or from parent RT- Sub-Address, e.g. Data word RT-2 Sub-Address 3333 Data word number three in the message.

All the Symbols above will be stored in the same Symbol file.

The figure *Symbols Pane and 1553 Protocol* shows how the Symbols in the Symbol Editor relate to the 1553 message protocol. The Symbol names in the figure were composed for use in this explanation, the user may give the Symbols any desired name, for example, "DataWord" could just as well be named Temperature Data. All the Data Item Symbols (CMDWord, DataWord, StatusWord) pertain to the Message type MR Symbol up through it parents Sub-Address Symbol and RT Symbol.



Symbols Pane and 1553 Protocol Note : This figure shows the Symbols pane expanded over the Default Event Properties pane

The following section will explain What To Do to setup each of the Symbol Types discussed above

8.4.1 Symbol Categories

The 1553 Monitor has one Symbol sections: Bus. This section supports two catagories: Range and Data Item. The STsi section supports catagories for Processors, Procedures, and Data Items. These Symbol sections and catagories are discussed more extensively in the Symbol Editor and STsi sections of this users guide.

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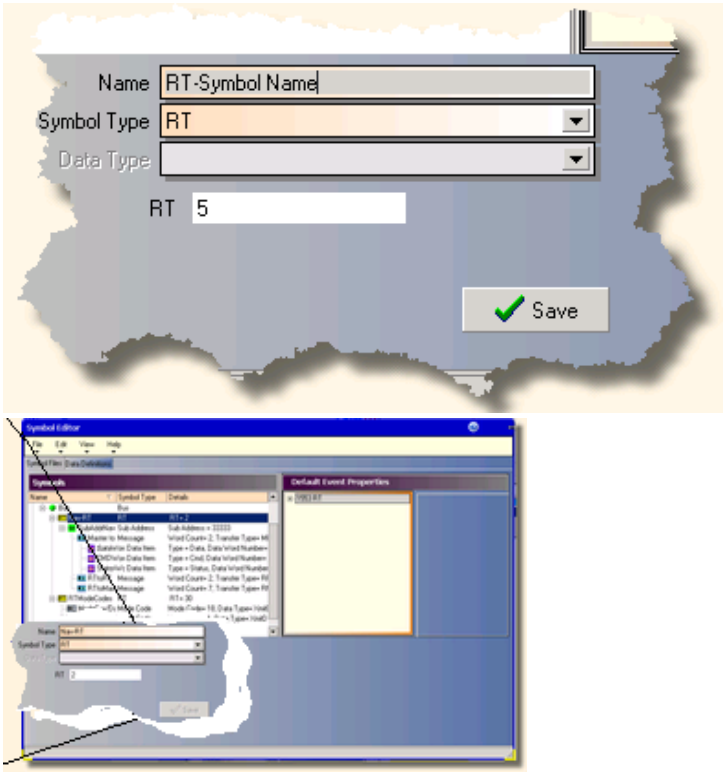
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8.4.1.1 RT Symbol

The RT Symbol Type is the first Symbol that must be created. No other Symbols can be created without an RT parent Symbol.

What To Do
If a 1553 Symbol File does not already exist you must create one.
Click on "File" in the Symbol Editor menu bar and select "New Symbol File" from the drop-down menu.
From the Target Symbol Group Dialog select "1553", compose and enter a name for the Symbol File, enter an Owners name, and any version number you wish. Click "OK", now you have established a new Symbol File as can be seen in the Symbol Editor Symbols pane. See the Symbol Editor chapter for more details about this procedure.

Now that the prerequisites are done, the RT Symbol may be created.
In the Symbols pane find and click on the ⊞ box next to the Symbol File just created or and existing Symbol File that you prefer.
Right Click on the Bus line (Bus) under the chosen Symbol File Name and click on "Add Symbol" in the drop-down menu.
Enter a Name, Symbol Type (RT is the only choice), and RT Number (0-31) in the dialog at the bottom of the Symbol Editor Window, shown in the figure below *Symbol Dialog*.



Symbol Dialog

Why
Creating the RT Symbol establishes a starting point to create child Symbols that may be used to capture message formats and Words within the message that this RT sends and receives.

Other Options
The creation of a Symbol is not the limit of the specification for the event to be captured. All Symbols

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may have additional characteristics specified through the Event Properties dialog. This dialog is within the Symbol Editor window. Go the Event Properties section to learn how to use these options.

Specifications

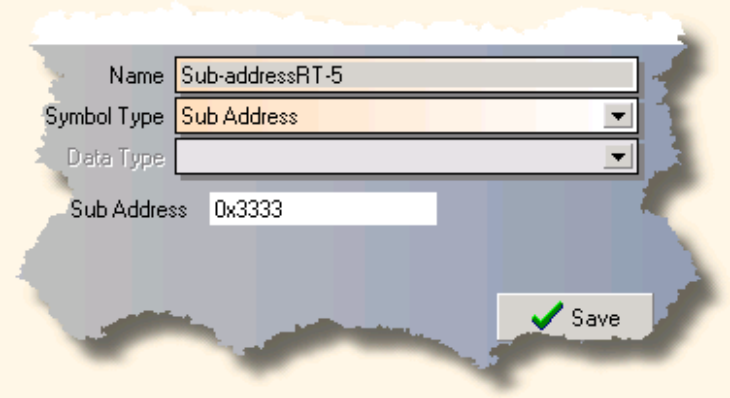
Radix used for RT entries	Decimal.
Remote Terminal (RT) numbers	Compliant with MIL-STD 1553. Any RT number greater than 31 will be ignored and will not collect data.
Multiple Symbols per RT	An RT may be represented by more than one Symbol.
Child Symbols below RT Symbol	There three child Symbol levels below the RT Symbol

8.4.1.2 Sub-Address Symbol

See RT Symbol before attempting to create this Symbol.
The Sub-Address Symbol Type must be created as a child of the RT Symbol. Message and Data Item Symbols can not be created without the Sub-Address parent Symbol.

What To Do
If a RT Symbol does not already exist you must create one, see the previous section, RT Symbol.

If the RT Symbol has been created, the Sub-Address Symbol may be created.
In the Symbols pane find the RT Symbol that you wish to create a Sub-Address Symbol under. If a box (⊞) is next to the RT Symbol, click on it to expand the Symbol tree.
Right Click on the RT line (RT) under the chosen Bus Line (Bus) and click on "Add Symbol" in the drop-down menu.
Enter a Name, Symbol Type (Click on ▼ and select Sub-Address), and Address in the dialog at the bottom of the Symbol Editor Window, shown in the figure below *Symbol Dialog*.



Symbol Dialog.

Why
The Sub-Address Symbol narrows the field of messages to capture going to and from the RT represented by the parent RT Symbol. The Sub-Address Symbol parents child Symbols that may be used to capture Message formats and Words within the Message that this RT sends and receives.

Other Options
The creation of a Symbol is not the limit of the specification for the event to be captured. All Symbols may have additional characteristics specified through the Event Properties dialog. This dialog is within the Symbol Editor window. Go the Event Properties section to learn how to use these options.

Specifications

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Radix used for Sub-Address entries	Decimal.
Sub-Address Range	Compliant with MIL-STD 1553. Symbol address beyond legal range will be ignored and will not collect data.
Multiple Symbols per Sub-Address	Sub-Address may be represented by more than one Symbol.
Child Symbols below Sub-Address	There are two child Symbol levels below the Sub-Address Symbol

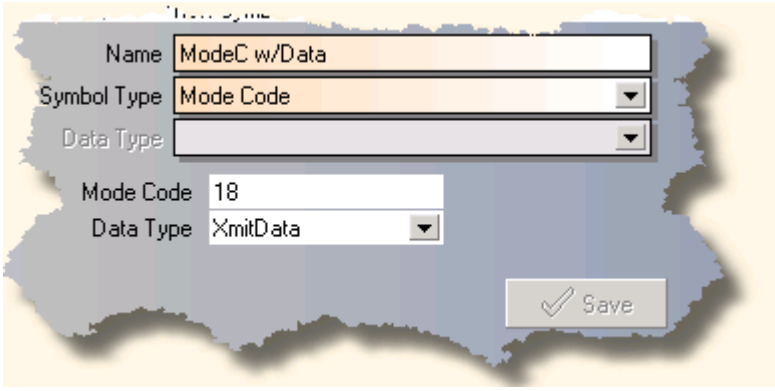
8.4.1.3 Mode Code Symbol

See RT Symbol before attempting to create this Symbol.
The Mode Code Symbol Type must be created as a child of the RT Symbol. The Mode Code Symbol occupies the same level in the 1553 Symbol hierarchy as the Sub-Address Symbol. Mode Code Data Item Symbols can not be created without the Mode Code parent Symbol.

What To Do
If a RT Symbol does not already exist you must create one, see the RT Symbol section.

If the RT Symbol has been created, the Mode Code Symbol may be created.
In the Symbols pane find the RT Symbol that you wish to create a Mode Code Symbol under. If a box (⊞) is next to the RT Symbol, click on it to expand the Symbol tree.
Right Click on the RT line (⊟ RT) under the chosen Bus Line (Bus) and click on "Add Symbol" in the drop-down menu.

In the dialog at the bottom of the Symbol Editor Window, shown in the figure below *Symbol Dialog*: Enter, Name, Symbol Type (Click on ▼ and select Mode Code), and Mode Code number. Also, enter a Mode Code Data Type (Click on ▼ and select one: XmitData, RcvData, NoData) this selection should be congruent with the nature of the Mode Code number entered, For example, MC-1 is NoData, or, MC-16 is XmitData.



Symbol Dialog

Why
The Mode Code Symbol will only capture Mode Code messages going to and from the RT represented by the parent RT Symbol. The Mode Code Symbol parents child Symbols that may be used to capture Mode Codes Words within the Mode Code Message.

Other Options
The creation of a Symbol is not the limit of the specification for the event to be captured. All Symbols may have additional characteristics specified through the Event Properties dialog. This dialog is within the Symbol Editor window. Go the Event Properties section to learn how to use these options.

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Specifications

Radix used for Mode Code entries	Decimal.
Mode Code Range	0 – 8 / 16 - 21. Reserved Mode Codes (9 – 15 / 22 - 63) will be handled as errors.
Multiple Symbols per Mode Code	Mode Code may be represented by more than one Symbol.
Child Symbols below Mode Code	There is one child Symbol level below the Mode Code Symbol.

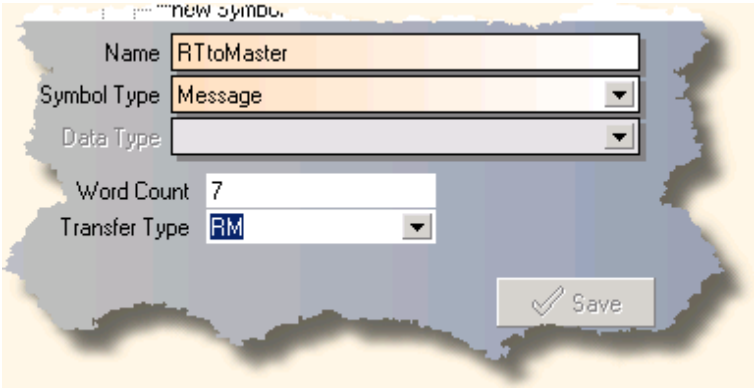
8.4.1.4 Message Symbol

See Sub-Address Symbol before attempting to create this Symbol.
The Message Symbol Type must be created as a child of the Sub-Address Symbol. The Data Item Symbols can not be created without the Message Symbol parent. The Message Symbol defines the characteristics of the Message transferred. There are three types of Message Symbols: MR, RM, and RR. Each of these types may have the Data Word Count specified. Data Item Symbols can not be created without the Message parent Symbol.

What To Do
If a Sub-Address Symbol does not already exist you must create one, see the Sub-Address Symbol section.

If the Sub-Address Symbol has been created, the Message Symbol may be created.
In the Symbols pane find the Sub-Address Symbol that you wish to create a Message Symbol under.
If a box (⊞) is next to the Sub-Address Symbol, click on it to expand the Symbol tree.
Right Click on the Sub-Address line (SA) and click on "Add Symbol" in the drop-down menu.

In the dialog at the bottom of the Symbol Editor Window, shown in the figure below *Symbol Dialog*: Enter, Name, Symbol Type (Click on ▼ and select Message), and Word Count (Number of Data Words in the Message). Also, enter the Message Transfer Type (Click on ▼ and select one: MR, RM, RR).



Symbol Dialog

Why
The Message Symbol allows you to specify the Message format to capture going to and from the RTs. This will allow the capture of only transmission from an RT (RM, RR), or only receptions by the RT (MR, RR). Specifying RR restricts message capture to Messages between RTs. The Message Symbol parents child Symbols that may be used to capture individual Words within the Message.

Other Options
The creation of a Symbol is not the limit of the specification for the event to be captured. All Symbols

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may have additional characteristics specified through the Event Properties dialog. This dialog is within the Symbol Editor window. Go the Event Properties section to learn how to use these options.

Specifications

Radix used for Message entries	Decimal.
Message Word Count Range	All formats of Word Counts from 0 to 31.
Multiple Symbols per Message	A Message may be represented by more than one Symbol.
Child Symbols below Message	There is one child Symbol level below the Message Symbol.

8.4.1.5 RT, SA, MC, Message Default Event Properties

SystemTrace Symbols and Events may be programmed with specific properties. These properties are available to the user in the Symbol Editor under DEFAULT EVENT PROPERTIES and in the Session Manager under EVENT PROPERTIES. The settings entered in the Symbol Set will become the default. These properties will be included with the symbol each time it is added to the Event List..

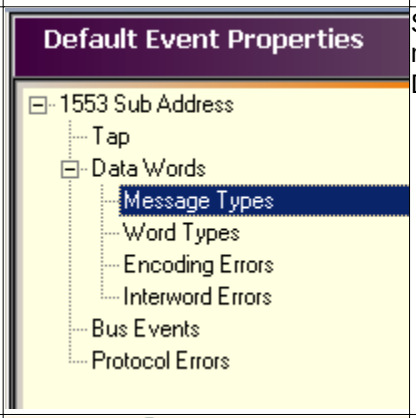
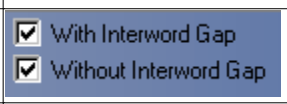
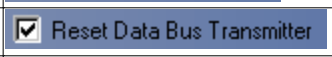
Property	Settings	Description
Tap - Select one or both		Bus A - Monitor data on Primar Bus B - Monitor data on Secon Default is BOTH
Word Types - select one or more		Select which types of words in monitored Default is ALL
Encoding Errors - select one or more		Select to monitor for messages of errors. Default is ALL
Inter-Word Errors - select one or more		Select to monitor messages wi errors Default is ALL
Rest Data Bus Transmitter		Select to monitor Data Bus Tra
Protocol Errors - select one or more		Select to monitor the message Default is ALL

Table 1553 Data Item Event Properties

8.4.1.6 Data Symbol

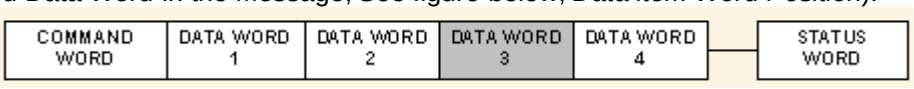
See Message Symbol before attempting to create this Symbol.
The Data Symbol must be created as a child of the Message Symbol. Data Symbols can not be created without the Message Symbol parent. The Data Symbol defines the words inside of a 1553 message. These may be Command, Status, or Data Words.

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What To Do

The Data Item Symbol Type must be created as a child of a parent Message or Mode Code Symbols. The Data Item Symbol is at the bottom of the 1553 Symbol hierarchy and defines the characteristics of a Word within the Message transferred. There are three types of Data Item Symbols: Cmd, Data, and Status. Data Type may have the Data Word position specified by number (e.g. 3 = third Data Word in the Message, See figure below, *Data item Word Position*).



Data item Word Position

If a Message or Mode Code Symbol does not already exist you must create one, see the Message Symbol or Mode Code Symbol section.

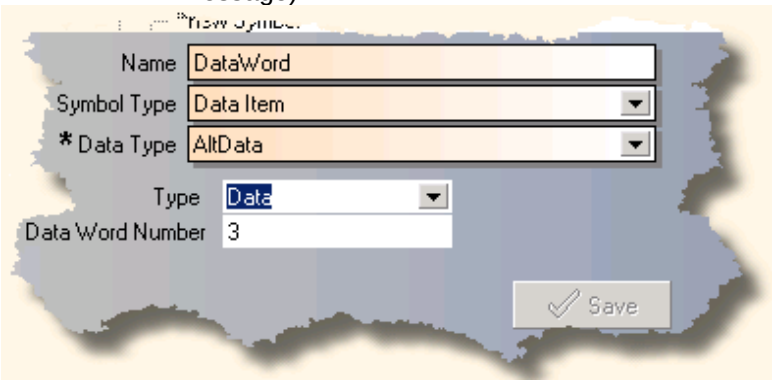
If the aforementioned Symbol(s) have been created, the Data Item Symbol may be created.

In the Symbols pane find a Message Symbol (or Mode Code Symbol) that you wish to create a Data Item Symbol under. If a box (⊞) is next to the parent Symbol, click on it to expand the Symbol tree.

Right Click on the parent Symbol line (⊟ MSG or ⊟ MC) and click on "Add Symbol" in the drop-down menu.

In the dialog at the bottom of the Symbol Editor Window, shown in the figure below *Symbol Dialog*:

Enter: Name, Symbol Type (Click on ▼ and select Data Item), and Data Type (*for this example select any available type). Also, enter the Word Type (Click on ▼ and select one: Cmd, Data, Status). If the Word Type "Data" is selected, the position of the Data Word within the Message should specified (e.g. 3 = third Data Word in the Message).



Data Symbol Dialog

Why

The Data Item Symbol allows you to specify a single Word to capture within a message going to and from the RTs. This will allow the capture of only Command Words or only Status Words. Specifying Data Word restricts Data Item capture to a Single Data Word in a specified position within the Message.

Other Options

The Data Item Symbol has the additional *Data Type specification which is defined in the Data Definitions window. From Data Definitions window the individual bits that make up a Word may be specified to define the characteristics of the Word to capture. The Data Definitions section (next section) will explain how to make custom Data Type that may be selected as part of this Data Item Symbol creation procedure. Proceed to the next section to learn how use the Data Definitions dialogs.

The Data Item Symbols may have additional characteristics specified through the Event Properties dialog. This dialog is within the Symbol Editor window. Go the Event Properties section to learn how to use these options.

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Specifications

Radix used for Data Item entries Decimal.

Data Item Word Position Range All formats, Data Word position with in the Message, 0 to 31.

Multiple Symbols per Word A Word may be represented by more than one Data Item Symbol.

Child Symbols below Data Item There are no child Symbol level below the Data Item Symbol.

8.4.1.7 Data Symbol Default Event Properties

SystemTrace Symbols and Events may be programmed with specific properties. These properties are available to the user in the Symbol Editor under DEFAULT EVENT PROPERTIES and in the Session Manager under EVENT PROPERTIES. The settings entered in the Symbol Set will become the default. These properties will be included with the symbol each time it is added to the Event List.

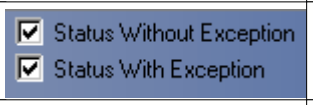
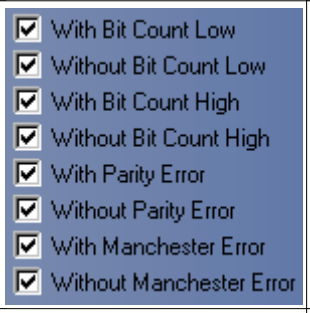
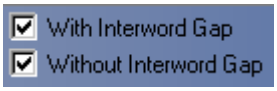
Event Properties		Description
Tap - one or both		Specifies to monitor Primary (A) or Secondary (B) bus connection. Defaults to BOTH.
Status Types - one or both		Selects to monitor for Status WITH or WITHOUT exception. Default is to BOTH.
Encoding Erros - one or more		Select to monitor data word with and/ or without various encoding errors. Default is ALL.
Inter-Word Errors- one or both		Monitor data word with Inter-word Gap error and/ or without inter-word gap error. Defaults to BOTH

Table 1553 Data Item Event Properties

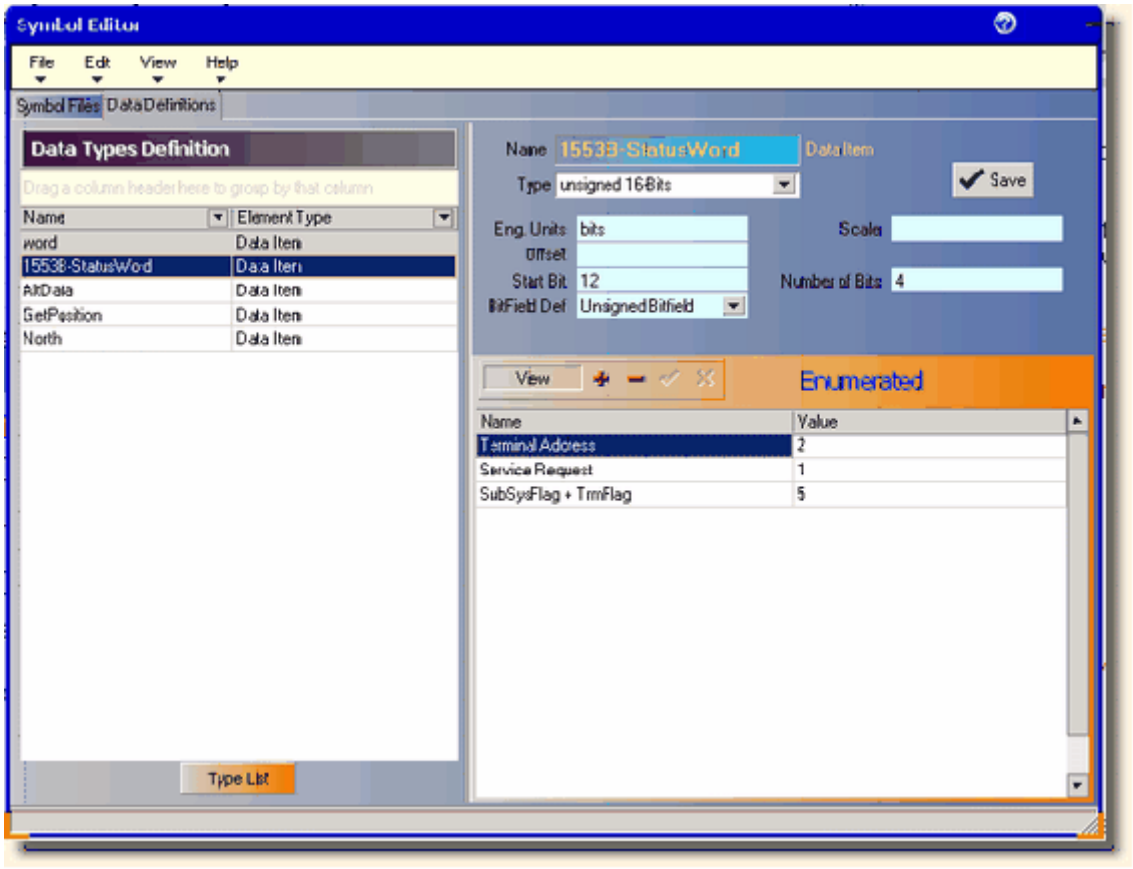
8.4.1.8 Data Definitions

The general use and function of the Data Definitions window is covered in the Symbol Editor Chapter, this portion of the 1553 Probe chapter covers 1553 Data Definitions only.

To Monitor activity on the 1553 Bus down to a detail level of bits will require the creation of custom Data Types. These Data Types are assigned to the Data Item Symbols upon its creation. The dialog window to specify custom Data Types is in the Symbol Editor under the Data Definitions tab and is shown in the figure below *Data Definitions Window*.

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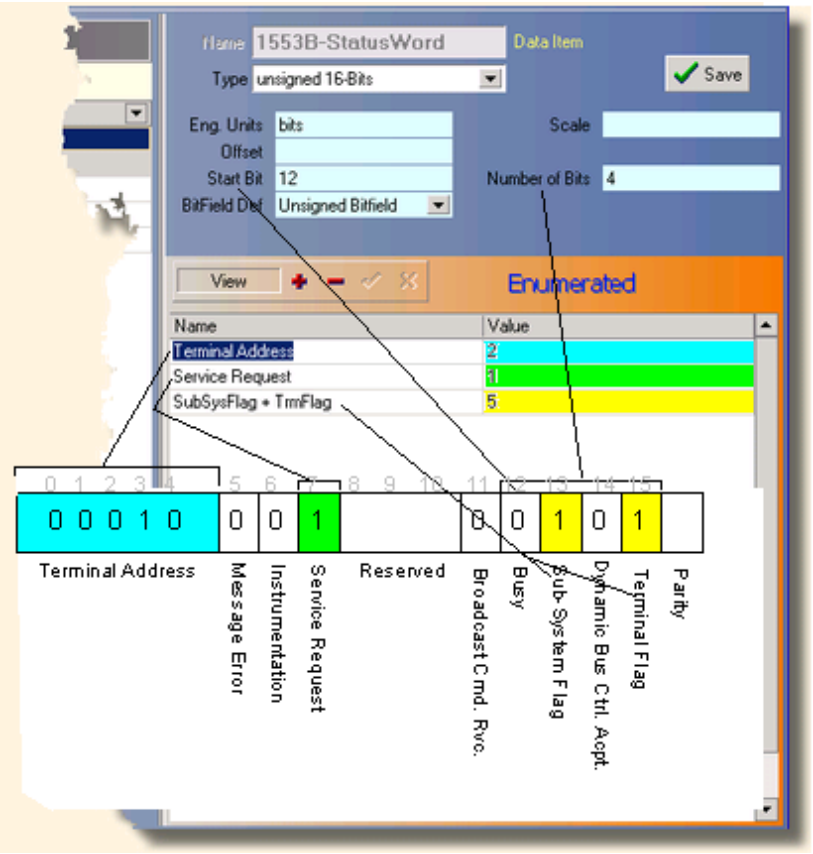
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Data Definitions Window.

When a Data Item Symbol is associated with a custom Data Type, a specific Word with specified bits set, interacting with the RT represented by the parent RT Symbol and its Sub-Address (or Mode Code) Symbol may be captured. The custom Data Types may be used for Data Item Symbols representing Command, Data or Status Words.
The figure below *Data Type Dialog* show how the dialog boxes relate to a Status Word to be captured from Terminal 2 with the Service Request, Sub-System Flag and Terminal Flag bits set.

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Data Type Dialog **verify drawing correctness**.

Use Ms word file MakeSymbol.doc as a template to fill in item below. It is Located in C:\S.B…1553 Draft dir.

What To Do

Why

Other Options

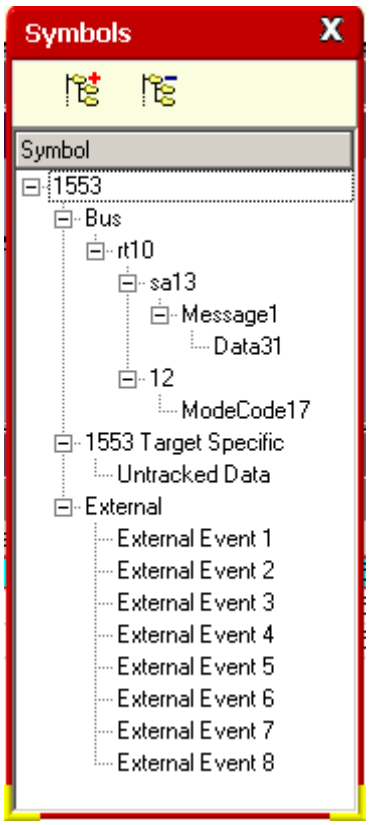
Specifications

Radix used for Data Item entries Decimal.

8.4.2 1553 Special Events

1553 includes some specific events that can not be defined in the Symbol Editor. Currently, this only includes Untracked Data. Untracked Data is defined as data messages that contain errors which make it impossible to decode the addressing scheme. To select Untracked Data, in the Session Editor, open the Symbol Browser and drag the event "Untracked Data" into the Event List.

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Part

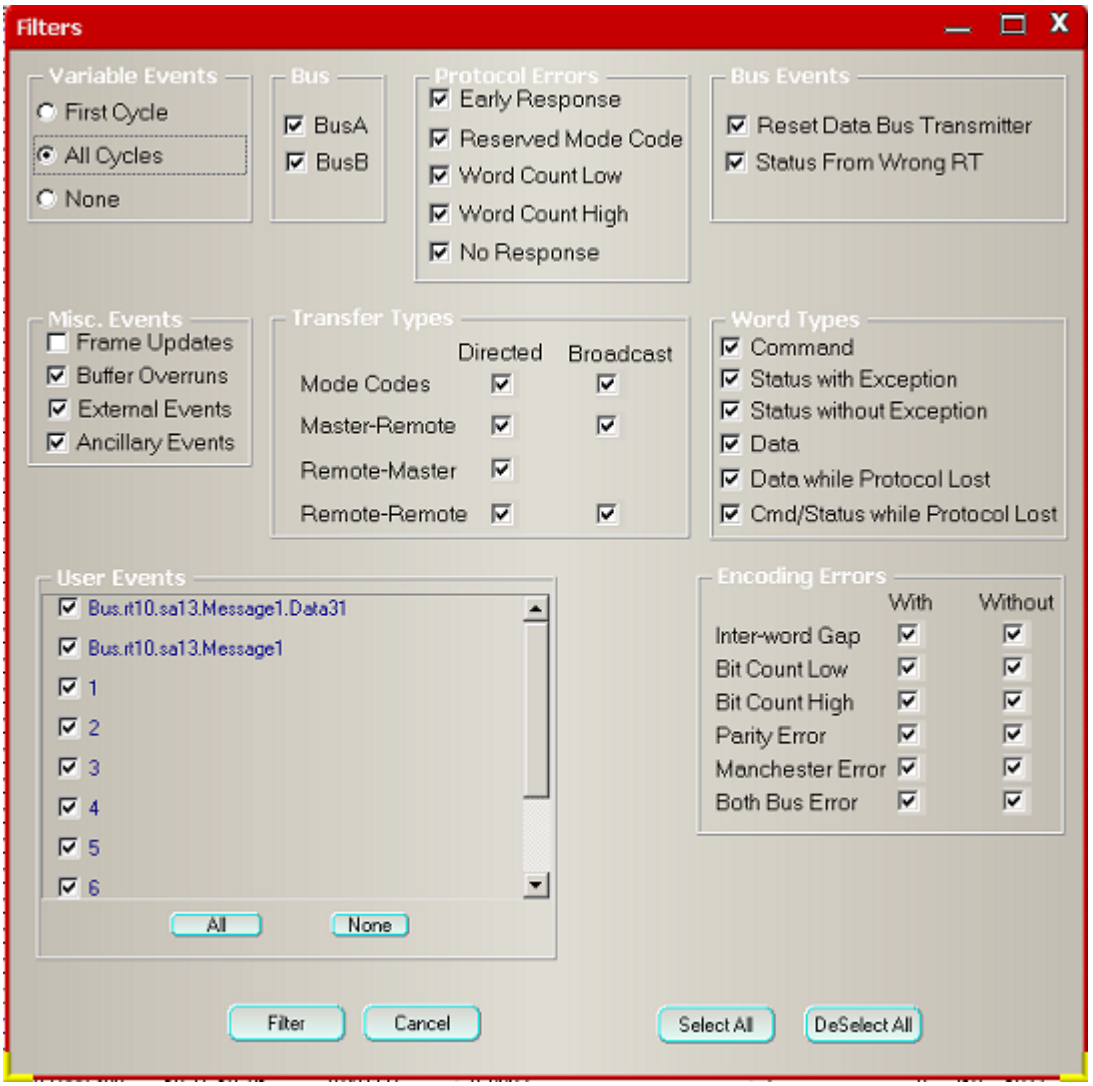


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9 1553 Analysis

9.1 1553 Event Table Features

SystemTrace provides an analysis program to display collected data filtered and formatted to the user's observational goals. The Analysis section should be consulted to understand its general uses and functions. The Analysis section in the 1553 Probe part explains Analysis features specific to 1553 Channel data collection.
The Display Filter dialog box is used to tailor the collected 1553 data presentation in the Event Table presentation. The 1553 Display Filter dialog window is divided into sections shown in the figure *1553 Display Filters*. An explanation of each section follows.



1553 Display Filters

What To Do
Select the desired item in the filter window shown above then click the Filter button.
Exit the window by clicking on the ✕ and accept the selections.
Click the Cancel button to undo any changes.

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9.1.1 Variable Events

"First Cycle Only", display first access of the bus only and none of the subsequent accesses associated with a data transfer that requires multiple bus cycles to be complete.
"All", display all access of the bus associated with a data transfer that requires multiple bus cycles to be complete.
"None" may be checked to exclude all Variable Events from the Event Table.

9.1.2 Misc. Events

"Frame Updates", "Buffer Overruns", "Ancillary Events", and "External Events" are all covered in the Post Run Analysis section. Check any combination in this section to include their occurrences in the Event Table.

9.1.3 User Events

"User Events" are the Events defined by the user in the Session Setup, before the test is run. Checking the box next to the Event name selects its occurrence for display in the Event Table.

9.1.4 Bus Cycle

"Bus Cycle" allows the user to put a finer point on the type of Events to be observed. For example, the user may wish to look at only reads within a Range Event (address range). Checking only the Read box in the dialog window would exclude writes or any other operation from the Range Event from being displayed.

9.1.5 Cycle Status

"Cycle Status" is reported in Event Table under a column of the same name ("Cycle Status"). These selections allow the user to choose to observe bus transfer success, failure and retry occurrences.

9.1.6 Bus Controller

"Bus Masters using" BR (Bus Request lines)- 0, 1, 2 or 3 is reported in a Event Table column "Master ID." These selections will include an identification of the Bus Master and Bus Request line involved with the bus transaction recorded in the Trace and History Record.

9.1.7 Mode Codes

"Bus Signals" selections allow the user to select an individual or a combination of 1553 bus control signals to be part of the Event Table. The occurrences of these signals are reported in the "Cycle Type" column of the Event Table. An explanation of the Bus Signals is provided in the "1553 Special Events" section of this chapter.

9.2 RunTime 1553 Display

Any item defined as a Data Item in the Symbol set and added to the Event List is available for Run Time Display as explained in the main Data Analysis section of this help file.

9.3 Bus Statistics

The Bus Statistics mode is used to display 1553 bus statistics while any Channel is monitoring the bus. A Channel is monitoring when its row in the Session pane Monitor Status column displays "On", or the Session name is in inverted colors.

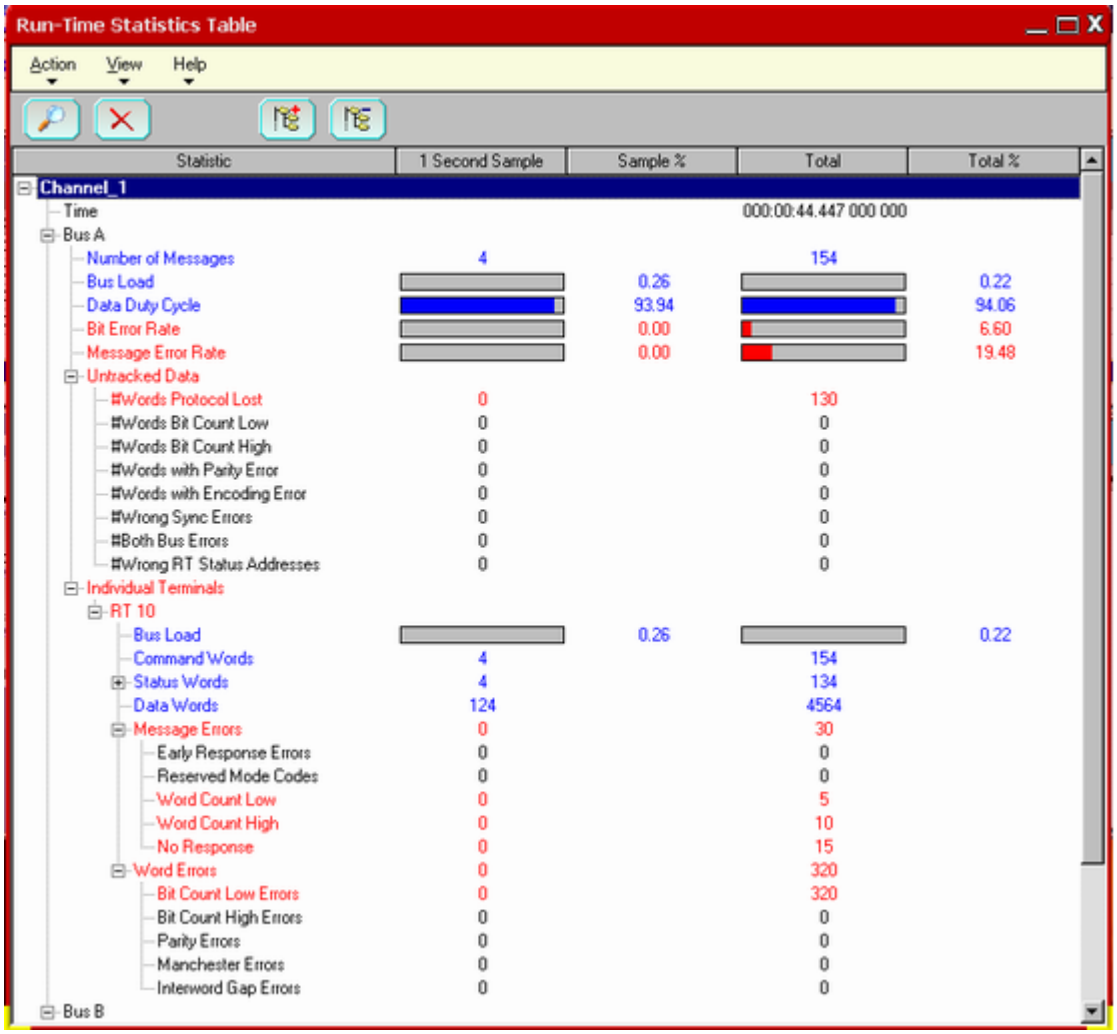
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What To Do
To display bus statistics, select "Tool Box" from the Control Console menu bar, "Standard Tools" | "RunTime Statistics" from the drop-down menu.

9.3.1 Reading Statistics

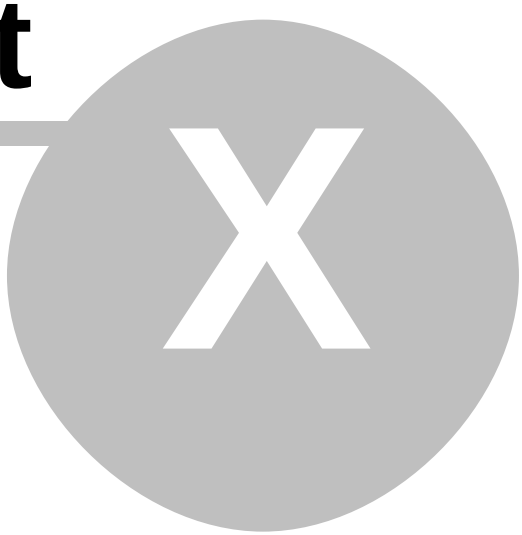
The Statistics mode is used to provide a statistical analysis of the 1553 bus activities. The figure *Statistic Window* shows the SystemTrace 1553 bus Statistics window. The rows list the statistical item and the columns report their values within temporal parameters. The four columns report the following:
1 Second Sample: shows actual number of occurrences or a bar gauge of each statistical item within the set sample period. These measurements are updated at the end of each sample period.
Sample %: shows the percentage of the total possible within the sample period for each statistical item. These measurements are updated at the end of each sample period.
Total Count: shows actual number of occurrences of each statistical item since the Monitor was started.
Total %: shows the percentage of the total possible for each statistical item since the Monitor was started.
If errors are present, the Statistics Window will change the Statistic title to RED.



1553 Statistics Window

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Part

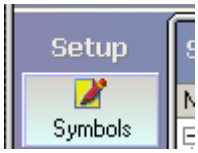


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10 SystemTrace Controller Chassis

10.1 Overview

This chapter covers the SystemTrace™ Controller Chassis. Interface Probe cards which are installed in this chassis are explained in separate chapters.
The SystemTrace™ Chassis Controller consists of a metal chassis enclosure, power supply, and Controller circuit card which contains a processor and hard disk for data storage. Communication to the Controller is accomplished using TCP/IP via the RJ-45 Ethernet connector on the front panel.



SystemTrace Controller with 1553 Probe

10.2 Requirements

10.2.1 Requirements

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10.2.2 Environmental Requirements

Operation Temperature 50º F to 95º F/ 10º C to 35º C
Storage Temperature 40º F to 104º F / 4º C To 40º C
Relative Humidity (non-condensing) 10% to 85%

10.2.3 Power Input Specifications

Voltage 85 -250 Volts AC
Frequency 47-440 Hz
Fuse 6 Amps / 250 V

10.3 Chassis Capabilities

10.3.1 Chassis Capabilities

Each SystemTrace™ Chassis is capable of supporting up to two Probes cards, unless otherwise specified. Typically, these Probe cards are ordered with the chassis and delivered installed in the unit. As new interface Probes are created, these Probes will be made available for purchase to our customers. See the ITCN website (http://www.itcninc.com) for more information on available Probes.

10.3.2 Controller

Each Controller board installed in a chassis contains a X86 architecture processor, Windows CE operating system/ kernel, and 20Gbyte Hard Disk. The controller communicates using an RJ-45 Ethernet port which supports 10/ 100 Mbit speeds for TCP/IP protocols.

10.4 Installation

10.4.1 Installation

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10.4.2 Power Connections

The Chassis is typically installed on a bench or tray in an equipment rack. Power input is located on the rear panel of the chassis. The power switch is on the rear of the unit at the power input module.Switch to "0" for off and "1" for on.

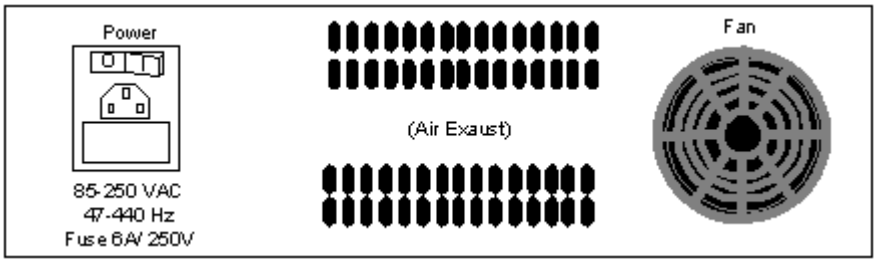
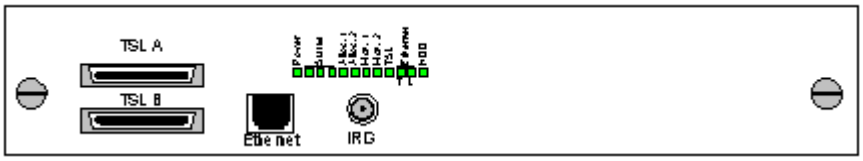


Figure Controller : 1 - Chassis Rear Panel

10.4.3 Controller Front Panel

The Chassis Controller front panel has connections for external TSL, Ethernet, and IRIG timing. In addition, there are 12 LEDs on the front panel. The LEDs are described below.

Power: Indicates power is on
Status: Used for Manufacturing Diagnostics
Alloc.1: Indicates Probe 1 is in use
Alloc.2: Indicates Probe 2 is in use
Mon.1: Indicates Probe 1 is monitoring data
Mon.2: Indicates Probe 2 is monitoring data
TSL: Red indicates in Standalone timing
Green indicates in multi-module (TSL) timing
Ethernet: T indicates Transmit/ Receive
L indicates a Link is present
HDD: Indicates Hard Disk Activity on the Log disk



Controller Front Panel

10.4.3.1 Network Connection

The network interface is accomplished using an RJ-45 (Category 5) interface. Typically, the interface is connected to a network hub or switch device, then to a PC workstation for control. If desired, a crossover cable may be used to connect directly to a workstation's NIC.

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10.4.3.2 IRIG Time Input

The Controller board supports IRIG-B time reference. This feature allows the user to connect the SystemTrace™ unit to an external IRIG time generation circuit. The unit will then use the IRIG time as a reference for data collection. If IRIG time is not collected, the PC workstation time is used as a reference. Vernier time (100 msec to 25 nsec) is kept by each unit. The IRIG connection is provided using a BNC front panel connector. This circuit must be externally terminated. Connect only a single unit to IRIG when using multiple chassis with TSL.

10.4.3.3 TSL Connection

The TSL connectors on the front panel of the controller board provide the ability to syncronize multiple units. The TSL connection provides corrected Time Synchronization pulses by determining any delays introduced by cable lengths. In addition, the TSL cables provide the routing for eight external trigger signals. These signals are bi-directional so that the user may send triggers based on programmed events or program to monitor for triggers generated by other units.

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