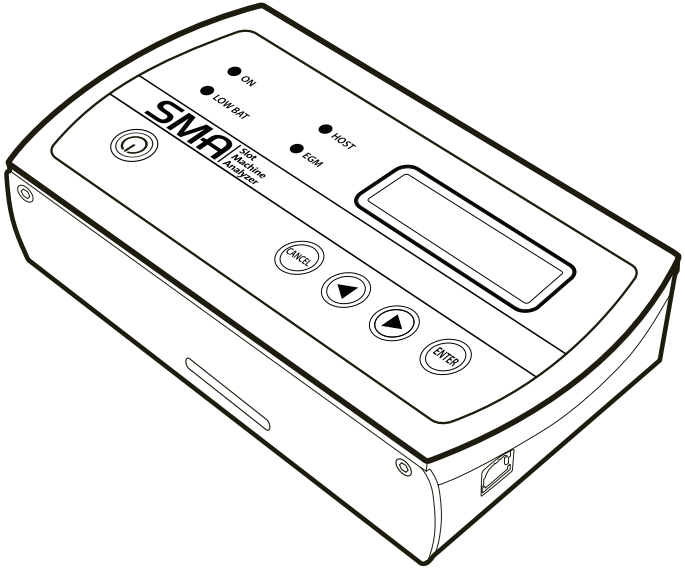
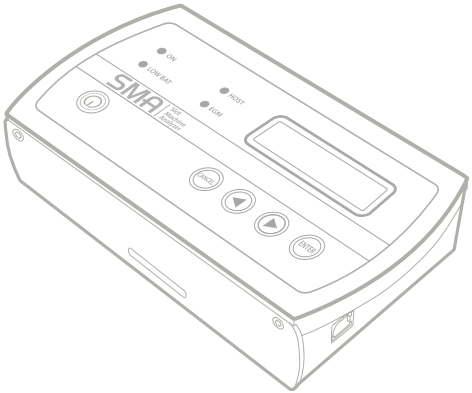


SMA | Slot Machine Analyzer

User´s Manual

www.slotmachineanalyzer.com

Table of Contents



What is the Slot Machine Analyzer?

The Slot Machine Analyzer (SMA) is a tool for capturing and exploring SAS communication traces. It is based on a versatile serial port device capable of intercepting a bidirectional serial com munication and providing post data analisis. This device works together with the SAS Trace Viewer (STV), a software for managing the traces captured by the unit. They can help to:

- detect system communication failures.
- develop / debug SAS gaming protocol.
- develop / debug embedded communication SAS hardware.

With the SMA unit you can:

- Capture traces of communication between the host and the EGM.
- Save the traces in the PC, or the SD memory card.

With the SAS Trace Viewer you can:

- Inspect the saved traces.
- Export traces.
- Find information with different criterias.
- Save searches for future use.
- Add comments to the traces.

Note: The SD memory format is propietary and it can't be read as a normal FAT file system. This means that the only way to access the traces stored in the SD card, is inserting the card in the SMA unit and connecting this unit to the PC or to use the Trace Viewer tool or SD Export Tool to read it.

Figure 1: Top view.

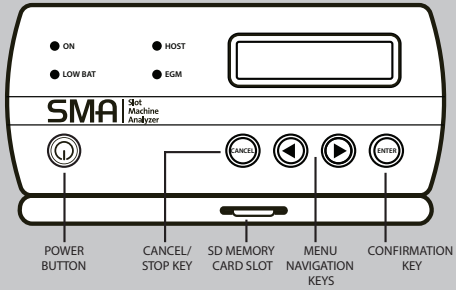


Figure 2a: Back view.

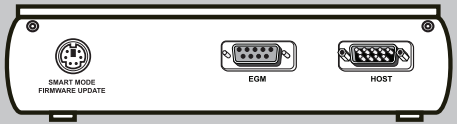


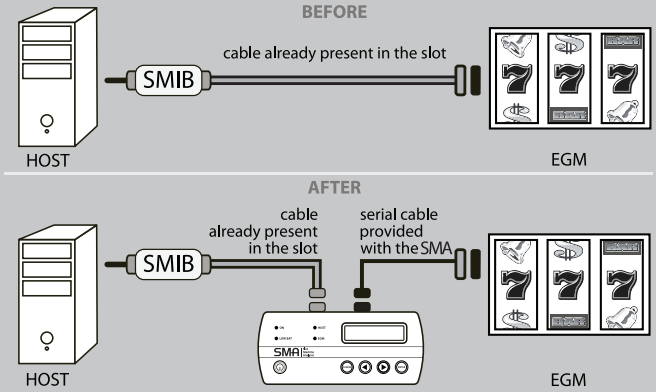
Figure 2b: Side view.

Operation

This manual describes the SMA unit operation and its companion software Sas Trace Viewer (STV). To start working with the SMA unit, first connect it to the system (HOST – SLOT Machine) through the provided serial cable, as shown in figure 3.

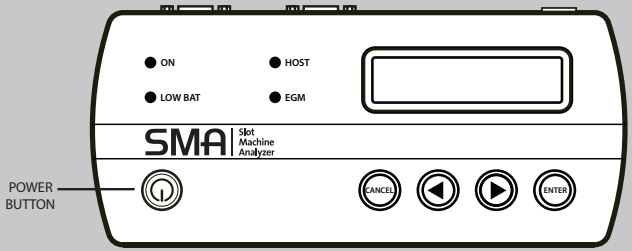
Check that the local current specifications match the power supply (110v/220v). If there is no external power supply connected, the SMA will try to run from internal batteries (4 AA batteries) or from USB connection.

Figure 3: SMA unit connections.



The SMA intercepts the SAS communication between the EGM and Host. Usually the original installed serial cable is connected between SMA and the Host.

Figure 4: Top view.



To turn the SMA Unit on, press the power button located in the top of the device once.

To turn the SMA Unit off, press the power button again.
The LCD display shows the following message:
Now the USB communication starts, the SD memory card is initialized and the firmware version of the unit is shown.

Figure 5: Initial message on SMA unit LCD screen

Keyboard Panel of the SMA

There are four keys to control the SMA Unit:

- LEFT & RIGHT: Menu navigation keys.
- ENTER: Confirmation key. It allows to enter a sub menu or to confirm an option.
- CANCEL: To cancel/stop an option or a process.

This manual identifies these keys with the following icons (see figure 6):

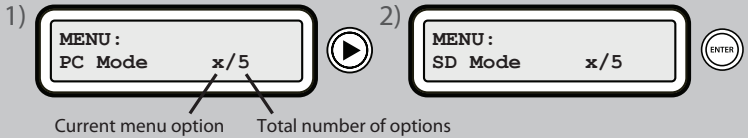
Figure 6 : SMA unit keyboard buttons

LED panel features:

- ON: the unit is on (green).
- HOST: there is communication from HOST (yellow).
- EGM: there is communication from slot machine (yellow).
- LOW BAT: A sustained blinking red light will indicate low battery condition.

When you navigate the menu, the display will show each item in the display, followed by the item number. For example, the main menu has four options, so each time you press the navigation key (right or left) this number will change accordingly from 1/5 to 5/5 . To confirm the selected option press the "Enter" key.

Figure 7: SMA menu display



In this example, if you are in PC Mode and then you press the right arrow in panel button, you will go to next option (SD Mode in this case). Numbers 1) and 2) are the sequence of steps. This convention will be used from now on to indicate the operation sequence.

SAS Trace Viewer (STV)

The SAS Trace viewer (STV) software application enables to view and work with SAS traces. STV is the key companion of the SMA to review in detail all the data collected with the SMA unit.

With the SAS Trace viewer you can:

- Inspect the saved traces.
- Export traces.
- Find information with different criterias inside a capture.
- Save searches for future use.

The SMA unit connects to the PC running the SAS trace viewer via an USB cable. The USB port is located in the right side of the device, as shown in figure 9:

The SAS trace viewer software has the following menu structure:

File	Edit	Window
Open Save SD Import Read from SMA TXT Export Quit	Copy Raw Copy Text Find Find Again Find Next Error Saved Searches Trace Porperties	Tile Horizontally Tile Vertically Cascade Close

Figure 8. Screenshot of the main screen of the SAS Trace Viewer. In this case there are 3 traces opened at the same time

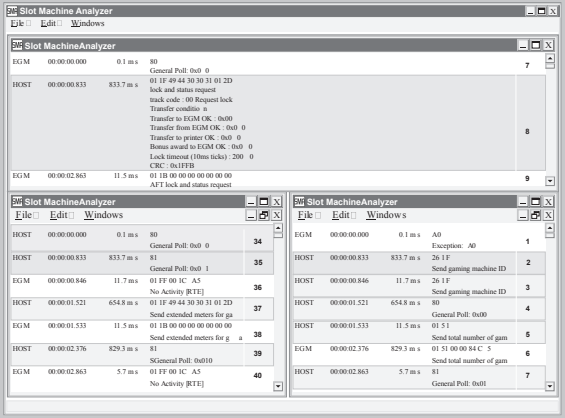
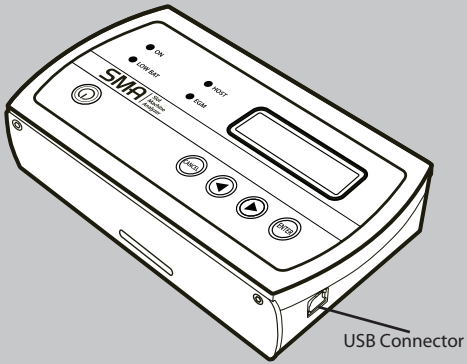


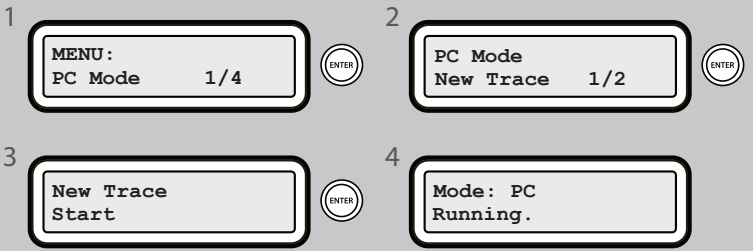
Figure 9: SMA unit – USB connector



Collecting traces

The SMA unit allows you to collect traces in two ways:

• On-line, PC mode : it collects the traces directly to the PC. The STV software must be running on the PC. The SMA will pick up live SAS data between host system and the slot machine, and will dump it in real time to the PC.
Note: the data will be transferred in real time to the PC but it will be displayed only when trace is finished.
• To the SD memory card, SD mode : it collects the traces to the SD memory card. There is no need for a PC connection, so you can use the SMA unit alone.

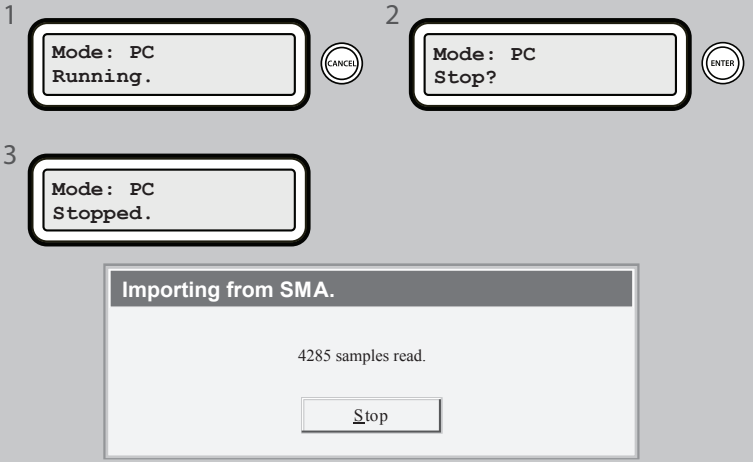


Collecting traces on-line (PC mode)

To start collecting traces in this mode, the PC must be running the STV software.
From the File menu, go to the Read from SMA option to start the data capture from the SMA.

In the SMA unit, navigate to the "PC mode", "New trace" menu option. To start, select "New Trace" from the menu and press "Enter".

To stop the capture, press "Cancel" and then "Enter", as shown in the following figure:



A dialog window will display the amount of samples captured. This dialog has a button to stop the capture process. When you press the Stop button you will see the captured data in the main window.

Figure 10 shows the main screen of this tool, with the traces captured:

The captured traces are called SAS protocol messages and for each one, the following data is shown:

- the source (HOST, EGM): host polls are shown in green, EGM responses are shown in yellow, and corrupted polls/ responses are shown in red
- its timestamp
- the time elapsed since the previous message reception
- the raw message dump (in hexadecimal) and the message description
- the message sequence number

If the message is bigger than 2 bytes, it can be expanded by double clicking on it (Figure 11). If you double click on it again, it will return to the collapsed form. Also, if the amount of bytes exceed the windows width, you will see a tooltip with all the message's bytes.

Figure 10 - Main Screen showing the collected trace

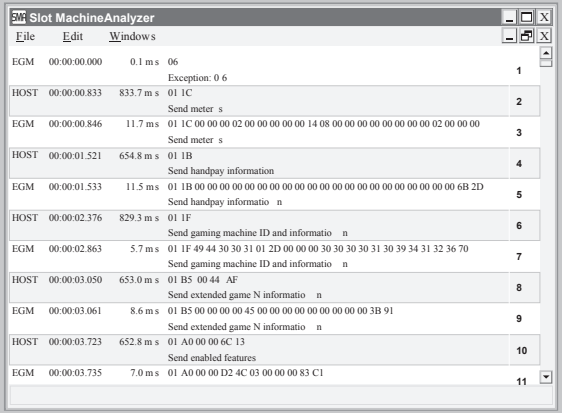
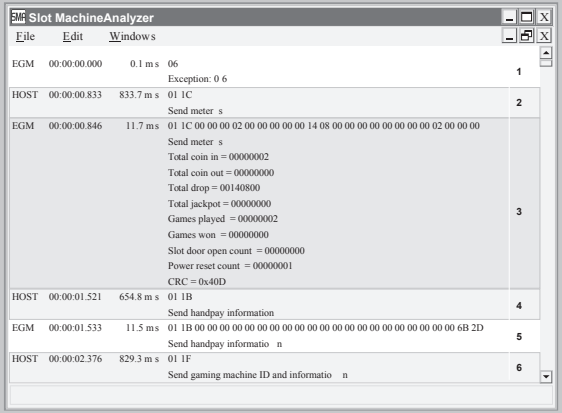
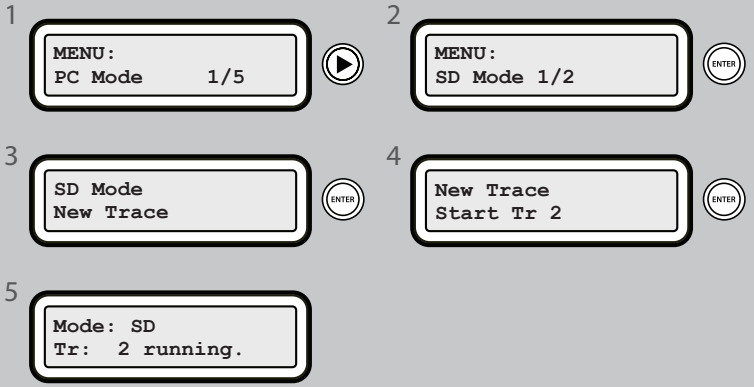


Figure 11 - Expanded message after row double click



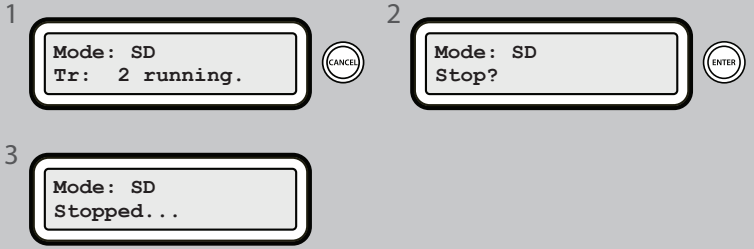
Collecting traces to the SD memory card (SD mode)

This mode is useful for capturing traces at a casino facility in an unattended mode . This mode does not require any PC connection.
After the SMA unit initializes, follow these steps to start capturing traces in SD mode.



To stop the capture, press "Cancel" and then "Enter", as shown in the following figure:

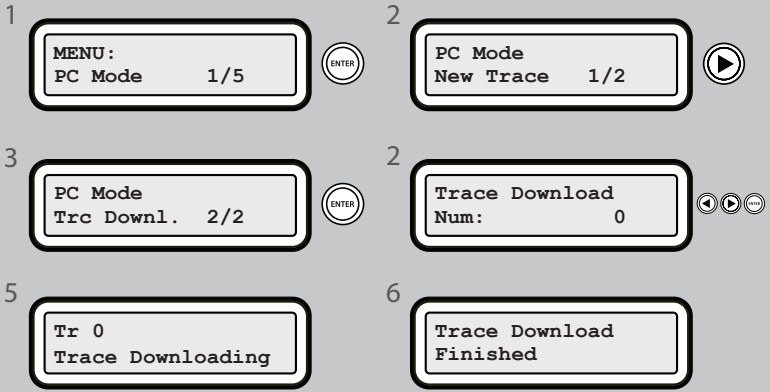
To download the traces from the memory card to the computer, you can use the SAS Trace Viewer provided. Another option is to use the SMA unit as a SD memory reader. This can be useful for small traces or if you don't have a memory card reader available at that moment.



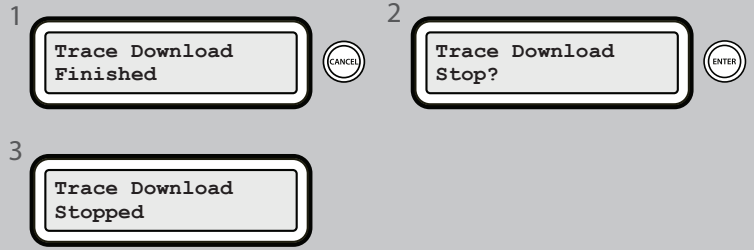
Note: Never remove the SD memory card from the SMA unit while the traces are being captured. This could cause the loss of all the data stored in the SD memory.

Download the traces recorded in SD mode

Follow these steps after the initialization, in order to download a trace from the SD memory card using the SMA unit:



Note that the default trace is number zero. If there is more than one trace stored, you can search for them with the "right" and "left" keys. Then confirm with the "Enter" key. The next screen will show the estimated download time for each trace, in the format hours:minutes:seconds. When it finishes, the screen will show the message "Finished". If you want to interrupt this process press the "Cancel" button and then confirm with "Enter".



Follow the instructions in the "SD Import" section of this manual to process the downloaded traces with the SAS Trace Viewer software.

SAS Trace Viewer Menus

The following section describes each of the menu options available in the SAS Trace Viewer.

File

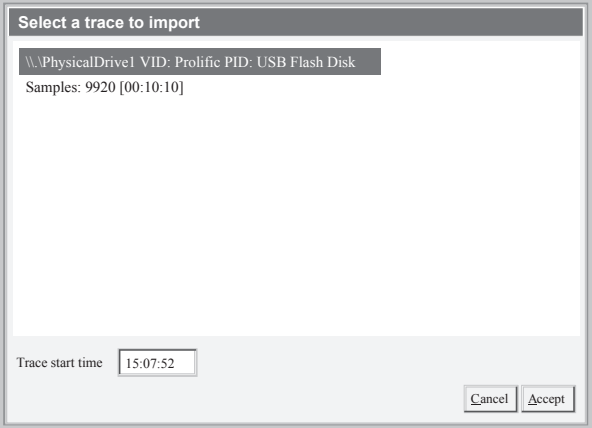
Use the file menu to open, save, import or export files.

- Open: opens a previously saved SAS trace image file.

- Save: saves a SAS trace to an image file the image file is the binary format of traces stored in the hard disk, and it is named with an .trc extension.

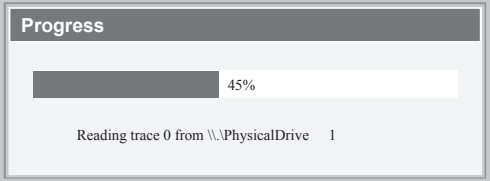
- SD Import: allows the dump of an SD memory contents (using an SD card reader, not provided with the SMA package).

Figure 12 - SD card import list. This is useful to read an SD content without the SMA unit



This screen (see figure 12) lists the detected valid SD memories. If you double click on one item, you will see a screen like the one in Figure 12, showing the traces in the memory.
When you select a trace and press the Accept button, the data will be downloaded into the main window. You will see a dialog showing the capture progress (Figure 13).

Figure 13 - SD card capture progress

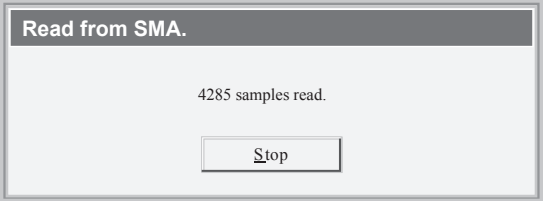


Read from SMA: this option starts the data capture from the SMA, the dialog will display the amount of samples captured. You can stop the capture process by pressing the Stop button. Then you will see the captured data in the main window.

TXT Export: exports the current trace in a human readable text format. The format is the same as the collapsed form of the packets.

Quit: this option will exit the application.

Figure 14 – SD card import



Edit

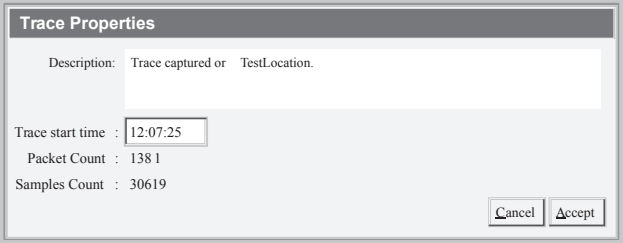
The Edit menu option enables you to manipulate the information associated with the traces:

- Copy Raw: copies the selected message as a sequence of hexadecimal digits into the clipboard. You can expand your selection using CTRL or SHIFT keys.
- Copy Text: copies the selected message in a human readable text format into the clipboard. The format is the same as the one you will see if you expand the packet. You can expand your selection using CTRL or SHIFT keys.
- Search: opens a Find dialog in order to find messages (see Find section for more information).
- Search again: searches for the next matching message using the same search options as defined using the Find dialog.
- Saved Searches: opens a dialog in order to create, edit or delete searches (see Manage Searches section for more information).

• Trace Porperties: opens a dialog showing information of the trace (Packet count and samples count), allowing you to edit the trace description and start time. See Figure 15 and review the second column in that window.

It is very important to set the trace start time property right because then you may use it to review the saved traces, in order to find problems in the stand alone mode. Note: this SMA hardware version does not include a real time clock. So the real start time will have to be entered manually (see figure 15) Its purpose is to match a potential instant of failure to the collected trace. When the trace lasts for more than 72 hours, it may suffer a small time drifting.

Figure 15 – Trace properties window



Window

Use this menu option to arrange the windows showing the different traces.

• Tile Horizontally: displays all opened traces by stretching them to the full width of the window, and stacked on top of one another.

• Tile Vertically: displays all opened traces by stretching them to the full height of window and placed in a row.

• Cascade: displays all opened traces by making them smaller than the window and partially overlapping them.

• Close: it closes the active trace window.

Search Dialog

This option allows you to make searches within a trace. This feature is useful to find out patterns, polls, or exceptions in long traces.

When you select search (from the Edit menu or by pressing CTRL-E), you will see a dialog like the one in Figure 16.
This dialog will show the last search you made.
Every search has a name used to identify it later on Manage Searches menu option.

It also has 4 buttons: Save, Clear, Cancel and OK.

- **Save:** saves the current search to be used later (see Search Organizer section).
- **Clear**: empties the search by removing all conditions in it.
- **Cancel**: cancels the search.
- **OK**: performs the search.

A search is made by one or more conditions. These conditions can be combined using AND or OR logical operations.
If no condition was added to the search, you will see an Add button (like the one in Figure 16) and a Remove button (enabled if you have a condition selected on the list).

The Add button adds a condition to the search. The Remove button will remove it from the search.
If there are conditions in the search you will see three buttons, OR, AND and Remove (see Figure 17).

Figure 16 – Search dialog window

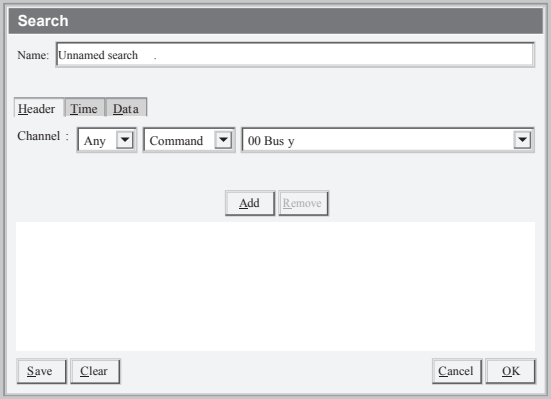
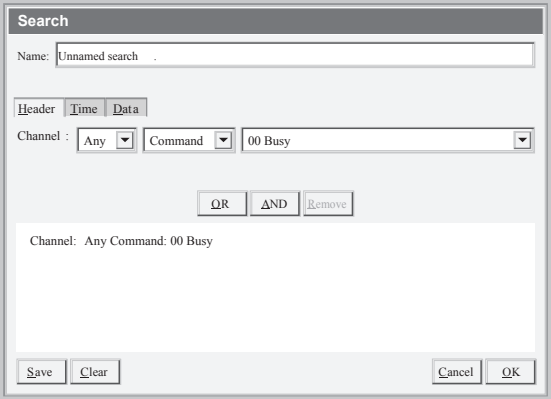


Figure 17 – Search dialog window



The OR button chains the condition to the search using the OR logical operation. The AND button chains the condition to the search using the AND logical operation. The Remove button removes the selected condition from the list.
The logical operations precedence is from top to bottom. The example in Figure 18 is processed in the following way:

("Channel: Any Command: 00 – Busy" OR "Channel: Any Command: 06 – Enable bill acceptor") AND "Time: > 100.00 ms.") AND "Time: < 600.00 ms.")

Use Case example: finding all the tickets inserted in the EGM

To explain how to build a search, consider the following scenario: you are having sporadic problems when a ticket is inserted into de EGM. You should start capturing a trace, and then perform the problematic action (in this example, insert a ticket) until the problem occurs. Stop the trace capture and open the "Find" dialog (CTRL+F). Whenever a ticket is inserted, the EGM issues the "Ticket Inserted" exception (0x67), so this is what we will look for. Select "EGM" from the Source combo box, select "Exception" from the contiguous one and finally select exception 67 from the exception list. Click the "Add" button. The search should look like this:

The SAS Trace Viewer will go to the first occurrence of exception 67, and pressing "F3" will cycle between all the occurrences of the exception.

Figure 18 – Search dialog window example

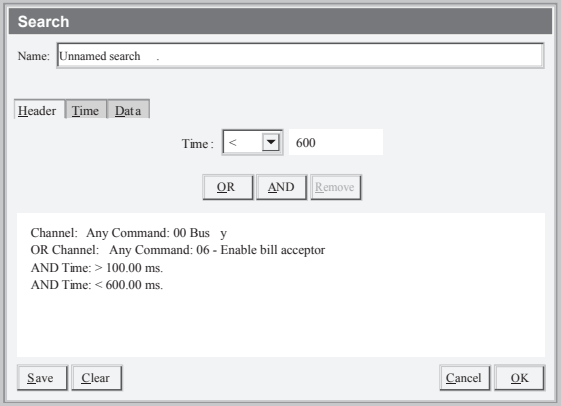
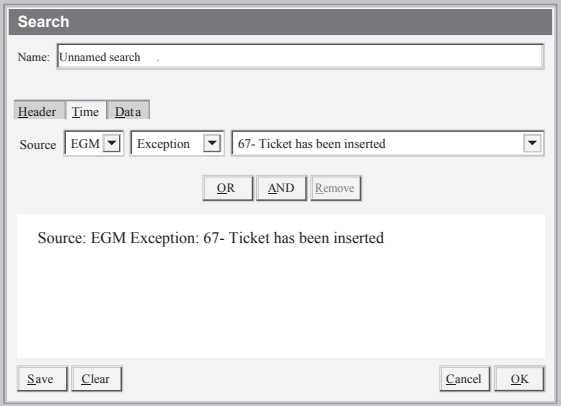


Figure 19 – Search dialog window with the "Insert Ticket" example



Condition Types

Header

This condition checks the message header in order to determine if the message satisfies the condition.

The condition has 3 selectable items:

1. Channel
- Host, only messages coming from the Host are listed
- EGM , only messages coming from the EGM are listed
- Any, any message coming from the EGM or Host are listed

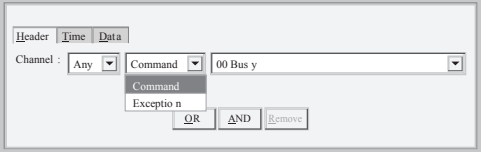
2. Command/Exception:
- Command, only messages that are polls or responses are listed.
- Exception, only messages coming from the EGM and which are, in turn, exceptions are listed.

3. Command/Exception code and description:
This option will show you a list of available commands/ responses or exceptions; only messages that match the code are listed.

Figure 20 – Condition types: Header

Figure 21 – Condition types: Header

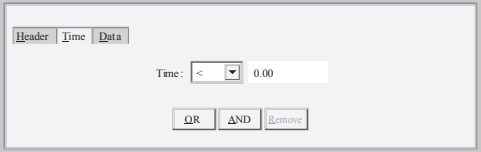
Figure 22 - Condition types: Header



Time

This condition checks the time elapsed from the previous message in order to determine if a message satisfies the condition.
In this condition you can select the comparison operator (<, <=, =, =>, >), and the time magnitude.

Figure 23 - Condition types: Time



Data

This condition checks if the message has custom data entered by the user in ASCII or hexadecimal mode, in order to determine if the message satisfies the condition.

Note: this type of condition checks the data entered in the Data field in the entire message, so this data will match values present in one or more message fields.

Figure 24 - Condition types: Data

Saved Searches

This dialog allows you to manage saved searches.
This dialog has five buttons at the bottom.

• New: creates a new search (see Find Dialog section for more information).

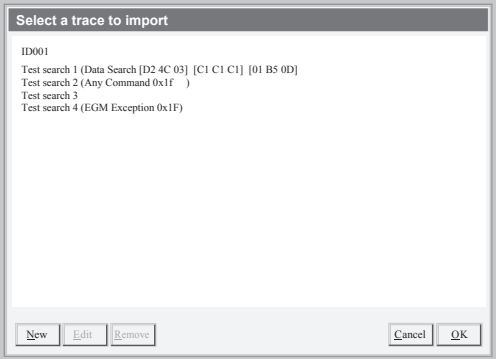
• Edit: allows you to edit the selected search (see Find Dialog section for more information).

• Remove: removes the selected search.

• Cancel: closes the dialog.

• Accept: if there is a selected search, it performs the search in the active trace.

Figure 25 - Condition types: Data



SMA Special functions

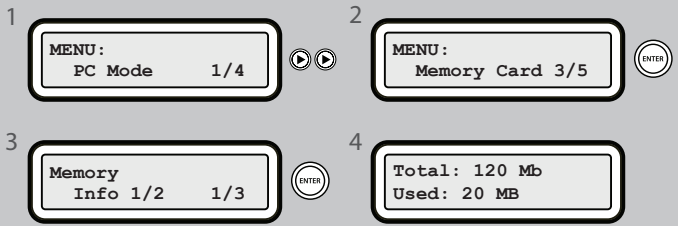
SD Memory management

The following functions allow to work with the SD memory card plugged into the SMA unit.

Check SD memory state

To check the capacity of the SD memory card follow these steps:

To quit press the “Cancel” key.

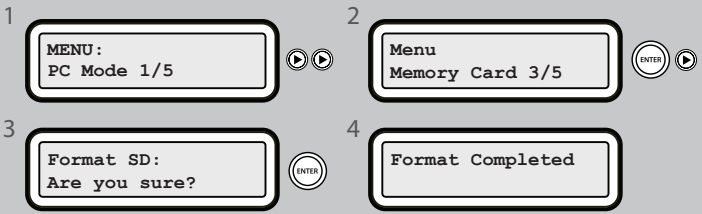


Format SD

When you insert a new SD memory card which has never been used with the SMA unit, or if you want to erase all the contents of the memory card, you will have to format it.

To do this, follow these steps.

Important: When you format the memory card, all data will be lost.



Configuration Menu

RTC

There is a RTC clock inside the SMA. Every trace will be tagged with date and time. This info is obtained from the RTC.

You can check current date/time by using the option Info or you can set the RTC by selecting the option Set RTC.
It must be noted that RTC is not maintained when the SMA is turned off. In future releases the RTC will be maintained by using a separate battery.

BEEP

You can set ON or OFF the beep signal generated in each button click on button panel.

BACKLIGHT

It can be set continuosly ON or in AUTO mode. AUTO mode will turn off the backlight after 10 seconds of keyboard inactivity.

UPDATE MENU

To update SMA firmware you need to select this option. By using the provided mini DIN to DB9 cable you can update the SMA firmware.

With the release of a new firmware version the instructions for firmware update will be included.

SMA SD Reader

There is another tool used to read the SD content and export it into a .trc file.

This tool enables a technician to get a trace and to export the trace to be sent by email or ftp, without need to use the full SMA Trace Viewer.

The usage is quite simple: insert the SD into your PC/Notebook, browse the SD as seen in figure 12 and save the trace in .trc format into some folder.

SMA tree menu structure

This section describes the complete options menu from the SMA unit. You can explore these options with the navigation keys, enter and cancel keys.

PC Mode (1/5)
SD Mode (2/5)
- New Trace (1/2) -> Start
- Trace Download (2/2) -> Select trace number -> Start

Memory Card (3/5)
- Info (1/2)
- Format SD (2/2)

Config (4/5)
- Rtc (1/3) -> Info (1/2) ; Set RTC (2/2)
- Beep (2/3)
- Backlight (3/3)

Update (5/5)

SMA Error Messages	Meaning
SD not present	This error appears if the SD memory card is not inserted in the unit, and you attempt to read or write the memory. If you turn the unit on with an SD memory card inserted and this message appears, try to remove and insert the memory card back. If this error persists, replace the SD memory card, as it might be corrupted.
SD needs format	This error appears if the SD memory card has not been formated with the SMA unit. If you format the memory card with the SMA unit and this message continues to appear, then it might be corrupted.
USB not ready	This error appears when you want to download a trace in PC mode and the connexion between the PC and the SMA unit is lost. The cause of this could be a defective usb cable or not properly connected PC and SMA units.

The traces will be lost if there is a power outage while traces are written into SD.
Also traces can be lost if the traces are not properly closed with the cancel / enter button sequence.
In spite of this, SMA includes an auto recover function.
When a trace is not properly closed SMA will try to fix it in the next SD access and leave the SD in a non corrupted state.

FAQ

Questions	Answers
Is there a limit on the number of traces on stand alone mode?	Yes. This number depends on SD memory card capacity, and it is also limited to 255 traces.
Which is the maximun size for a single trace?	It is no limited. It depends only on the SD memory capacity (on stand alone mode).
Which is the minium size for a single trace (on stand alone mode)?	It is 512 bytes, on a SD memory card.
Is it possible to change the baud rate on the SMA Unit?	No, this model does not allow to do that.
What kind of SD is accepted?	Up to 32 Gb. SMA is optimized for SD larger than 4Gb.
Is its possible to recover a trace after formating the SD memory card (using the SMA Unit)?	No, it is not possible.

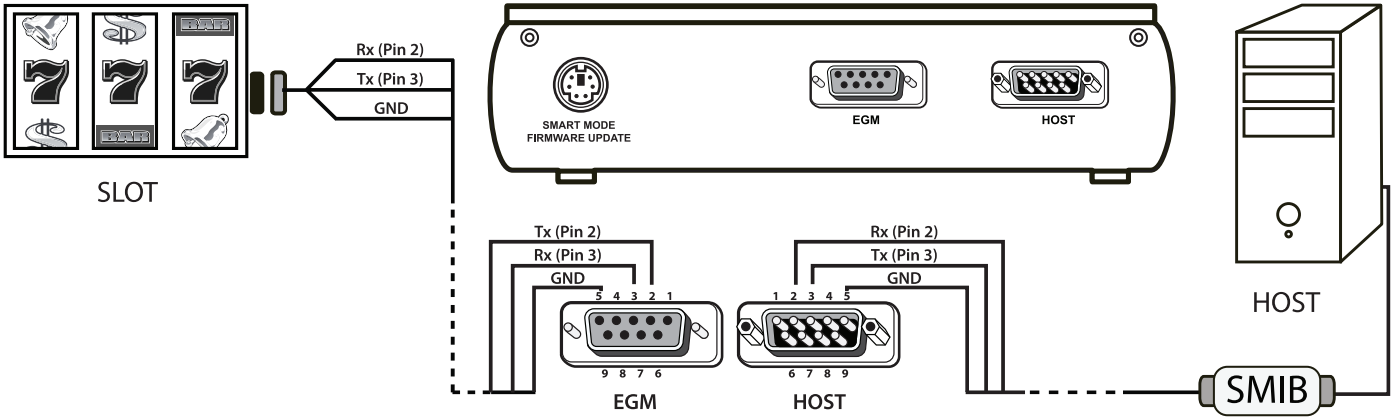
Glossary

- EGM : Electronic Gaming Machine.
- SLOT: a synonymous of EGM.
- SMIB: Slot Machine Interface Board.

Contact

www.slotmachineanalyzer.com
support@slotmachineanalyzer.com

Detailed connection wiring schematic



EGM FEMALE	
Pines	Description
2	TX
3	RX
4	GND

HOST MALE	
Pines	Description
2	RX
3	TX
4	GND

SMA | Slot Machine Analyzer

www.slotmachineanalyzer.com