Introduction

The *S4 Validator* is a special version of the S4 programmer that has been modified to perform comprehensive validation of EPROMs. This is accomplished by using various hash algorithms to calculate a "signature" or "code" for the data contained within them.

The *S4 Validator* differs from the standard S4 in that it **cannot be used to program or alter the contents of EPROMs.**

The *S4 Validator* has 2 validation methods.

1. The gold-labeled library ROM enables the user to check devices with a similar signature to the Kobetron™ 3000

2. The silver-labeled library ROM enables the user to check devices with an SHA-1 40-character signature as used by the Nevada Gaming Control Board.

In addition, the *S4 Validator* can perform a bit by bit compare against a master device. This feature is discussed later in the *Compare* section of this manual.

The *S4 Validator* is also supplied with a 40-pin module for validating 16-bit 40-pin EPROMs, and a padded carrying case for safely storing the Validator and all its accessories.

Setting up

The *S4 Validator* is supplied with the latest version of the Validator-32 Library pre-loaded. To re-load this Library (or any of the other Libraries) please use the following procedure:

Lift the lever on the *S4 Validator's* ZIF socket and place the desired Library ROM into the socket then close the lever. Make sure the notch in the Library ROM is facing the LCD display and that the ROM is seated all the way at the base of the socket towards the lever. Press **LIB** then **ENTER.** The desired Library ROM will be loaded and the *Validator* will display one of the following messages depending on which Library is loaded:

```
DATAMAN S4
VALIDATOR-32 Vx.xx
512K BYTES RAM
>
```

```
DATAMAN S4
VALIDATOR SHA1 Vx.xx
512K BYTES RAM
>
```

How to use the S4 Validator

To obtain a signature for any given EPROM, use the following procedure:

1. Place the EPROM into the *S4 Validator's* ZIF socket. All EPROMs that are smaller in size than the socket (24 & 28-pin devices) should be placed at the *bottom* of the socket towards the lever. The EPROM notch must be facing upwards towards the LCD display. If the EPROM you wish to check is a 16-bit, 40-pin device, you must use the 40-pin module that shipped with your *S4 Validator*.

2. Place the 40-pin module into the *S4 Validator* ZIF socket and close the lever, then place the 16-bit, 40-pin EPROM into the ZIF socket of the 40-pin module and close that lever. Again, the notch must be facing up towards the LCD display. **Note that the 40-pin module must only be used for 40-pin EPROMs**. All other (24, 28 & 32-pin) EPROMS must go directly into the *S4 Validator's* ZIF socket and will not work correctly if placed into the 40-pin module.

3. Press the *GREEN* **SUM** button. Please note that *S4 Validator* also has a *GREY* SUM button, which has a different, unrelated function.

The *S4 Validator* will begin by interrogating the EPROM placed in the socket. It reads a two-byte code from the EPROM, which represents the manufacturer and device type. It will then match this code against a Library of devices stored in its memory.

Next, the *S4 Validator* reads every byte (or word) of data from the EPROM. It then uses one of its robust algorithms (depending on which library is loaded) to calculate the appropriate signature value for the data. Typical screens using the Validator-32 Library will look like this:

```
VALIDATOR-32
Working...
Chip:27C256B
```

This indicates that the manufacturer and device codes have been successfully read from the EPROM and a match has been found in the *S4 Validator's* Library (27C256B). The *S4 Validator* will begin to tick away as it starts to calculate the unique signature. The signature will then be displayed as an eight digit number (9AA99U5A).

```
>
>
Sig: 9AA99U5A
>
```

The SHA-1 Screen will display the words HASH SHA1 and the chip type inserted. In addition, it will also show a progress bar. Typical screens using the *S4 Validator* SHA-1 Library will look like this:

```
>HASH SHA1
Chip:27C256B
S |||||||||||||||| F
```

This indicates that the manufacturer and device codes have been successfully read from the EPROM and a match has been found in the *S4 Validator's* Library (27C256B). The *S4 Validator* will begin to tick away and display a progress bar as it calculates the unique signature. The signature will then be displayed as a forty digit number (7C6A 8E93 3511 712B 9BA5 9B86 0D1A 5B91 167C 4F8E).

```
SHA1 SIG: 7C6A 8E93
3511 712B 9BA5 9B86
0D1A 5B91 167C 4F8E
>
```

It is intended that these signature values should be printed or written on a label and placed on top of the EPROM for future reference. A master listing of all game signatures should also be kept in a safe location in the event that the EPROM labels fall off and get lost. Following these procedures will ensure maximum security and prevent accidental use of incorrect signatures.

If any data within the EPROM has been changed, however small or insignificant it may seem, the resulting signature will be **radically different** to the *original* signature, indicating that the EPROM may have been tampered with.

As previously mentioned, the *S4 Validator* cannot be used to *program* EPROMs. This feature has been disabled in hardware and software. If an attempt is made to program an EPROM, the *S4 Validator* will display the following warning message:

```
>BURN not Allowed
>
```

These programming limitations have been incorporated in both of the *S4 Validator* Libraries (Validator-32 and the SHA-1), and cannot be circumvented. All other device and memory functions have remained enabled and can be utilised while in Validator mode. These include all RS-232 port functions, all memory features/functions, and of course all emulation functions of the standard S4 Programmer.

No Signature Found

Not all EPROMs will automatically be recognised by the *S4 Validator*. This is because some older EPROMs do not contain the manufacturer and device codes used for identification. Also, if a manufacturer develops and manufactures a new device, it is likely to have new codes not listed in the *S4 Validator's* current Library. In the event that the *Validator* cannot find a proper match in its library for the EPROM you have inserted in the ZIF socket, it will display the following:

```
>VALIDATOR-32
No signature found
Generic 2716
```

The *S4 Validator* may also display "**NO MATCH FOUND"**. If either of these two messages appear, choose a similar device from the Generic list of the most common 24, 28 & 32-pin EPROMs: 2716, 2732, 2764, 27128, 27256, 27512, 27010, 27020, 27040, 27080. If you are trying to validate a 40-pin EPROM when you get one of these error messages, select one of the following 3 generic 16-bit, 40-pin type EPROMs: 271024, 272048, 274096, 27C800, 28HC256.

To select the EPROM size from the Generic list, press the right or left arrow button until you have located the desired size, then press **ENTER.** The *S4 Validator* should now start to beep and begin the validation process.

Bit by Bit Compare

Another way to validate an EPROM is to use the compare (**COMP**) command. This can be used to compare one device against another to ensure that both their data are 100% identical.

There are two ways to perform a bit by bit compare. One way is to read a master device into the *S4 Validator's* memory then compare it to another device. The second method is to download a file containing the device data from your PC into the *S4 Validator's* memory and then compare it to another device.

To perform a bit by bit compare of two devices, a master and a duplicate, please use the following procedure;

Insert your master device in the *S4 Validator's* ZIF socket following the steps previously discussed under Item 1 on page 3. Press **FUNC** then the **PROM** button. This will enable the *S4 Validator* to perform a silicon signature on the master device in the ZIF socket and set up all the necessary parameters it needs to read the device properly. Once it displays the EPROM manufacturer and type, press **ENTER** to accept it. If the *S4 Validator* displays an error message that says **No Silicon Signature Found** or **No Match Found,** it means that the master chip either has no silicon signature or it is not listed in the current Library. If this error happens, inspect the device for device type details on its package (normally found on the topside of the device). Once you have determined the manufacturer and device type then press **PROM,** press the

down arrow and scroll through the list of manufacturers (in alphabetical order). Then use right arrow to locate the required device (devices are normally listed in order of memory size). Once you have located the device, press **ENTER** to select the device type.

When you have the required master device selected, press the **LOAD** button then **ENTER.** This loads the contents of your master device into the *S4 Validator's* memory. Now that the master device is loaded into memory, press the **COMP** button then **ENTER**. This will compare the contents of your master device with the contents of *S4 Validator's* memory. This will ensure that you have loaded the master device correctly into memory and that the contents match the master device bit for bit. Now you can remove the master device and insert your duplicate (or game device) that you wish to compare against the master. Place this device into the ZIF socket of the *S4 Validator* and press the **FUNC** then **PROM** button to read the silicon signature of the device and then **ENTER** to accept it. If you get an error message **No Silicon Signature Found** or **No Match Found**, please follow the same procedure used for the Master chip above.

Once you have the device selected properly, press **COMP** and then **ENTER**. This will compare the contents of the *S4 Validator's* memory (master device) with the contents of the device in the socket (game device). If the master and game device match bit for bit, the *S4 Validator* will display the message "**SAME**". If there is the slightest discrepancy that exists

between the master device and the game device, the *S4 Validator* will give you the following message:

```
>COMPARE 27C256B
00000-07FFF
00000 RAM=FF ROM=00
```

This indicates the device being read in the *S4 Validator's* ZIF socket (27C256B) and the address range of that device (00000-07FFF). The last line indicates where the error occurred between the *S4 Validator's* memory (RAM) and the device in the ZIF socket (ROM). The address at which the error occurred (00000) is at the beginning of the line. In this example, the error occurred at address 00000. The master chip (RAM) contained the data FF and the game device (ROM) contained the data 00.

The second method of performing a bit by bit compare is to download a file from your PC that contains an image of the master device you wish to compare against. To perform a bit by bit compare using this method, you must first perform the steps listed under "Setting up the Serial Port" on page 12. Then follow the "Downloading files to S4 Validator" procedures listed on page 14. Then follow the loading and comparing a game device steps listed under the "Bit by Bit Compare" section on page 8.

Setting up the Serial Port

To download files using the *S4 Validator*, you will require the latest version of the S4driver for Windows and a serial cable as defined on page 81 of the S4 Programmer manual.

Once you have the S4driver installed on your PC, you must next configure the Com port to the correct settings. The Baud rate can be set from 300 bits per second to 115,200 bits per second and is user changeable. Always ensure that the Baud rate on the S4driver software is set to the same Baud rate as the *S4 Validator*. If the Baud rates are properly set, turning the *S4 Validator* on and off several times should cause it to echo the contents of the LCD display back to the screen of your PC.

To check or change the RS232 settings on the *S4 Validator*, press the **Setup** button. The display will show you the file type you are currently set to receive **(i.e. - Intel, ASCII, Binary or Motorola)**. If you wish to change this setting, press the right or left arrow button. Once you have the correct file type selected, press **Enter**. The next setting is the Baud rate currently selected. Again, using the right and left arrow keys, select the desired Baud rate then press **Enter**. It is recommended that the handshake setting be set to **/RTS**. Using the right and left arrow keys, select this setting then press **Enter**. Now select the desired download sound setting using the right and left arrow keys then press **Enter**. The last setting (UL Bytes/Line) should be left at a default setting of **20**. Press the **ESC** button to save

and exit the setup function and return to normal mode.

To check the Com port settings in the S4driver software, left click your mouse on Preferences in the Menu bar, then on Port setup.

Transfer	Preferences	Help
	Colours...	
	Port setup...	
	Directories and files...	
	Save Preferences	

Please check that the *Parity* is set to **None,** *Data bits* to **8** and *Stop bits* to **one** and that the Baud rate is set to the same Baud rate that you have the *S4 Validator* set to in the setup function. Remember that the Baud rate settings here **MUST** match those of the *S4 Validator* in order to communicate with the PC. When the Com port is correctly configured, left click on OK and return to the main screen.

Downloading Files to S4 Validator

Prior to downloading a file to the *S4 Validator*, you will need to know the format of the file. To check the file format, it is recommended that you use the "File Examine" feature under "File" on the menu Bar of the S4driver software. This feature will scan your file and tell you the format, length, range and checksum of the file.

Remember that the *S4 Validator* settings must be set to the same format type as the file in order for the file to download properly. If the format setting of the *S4 Validator* has to be changed, please refer to the Setting-Up Serial Port section on page 11.

To Transfer files from your PC to the S4, left click on Transfer on the Menu bar. Choose the Download function, enter the file name and left click on OK.

Transfer	Preferences	Help	
Upload EEPROM (S4>PC)			F5
Download EEPROM (PC>S4)			F6
Upload (S4>PC)			F7
Download (PC>S4)			F8
Download Library			F9
PC Receive			
PC Transmit			

Intel Hex and **Motorola S** format files will download automatically after the above procedure has been carried out. However, Binary and ASCII files require file ranges to be entered before the file can be downloaded. The File Examine feature will inform the user of the range of the data.

Below is the typical message that the user will see after performing a File Examine on a Binary or ASCII file.
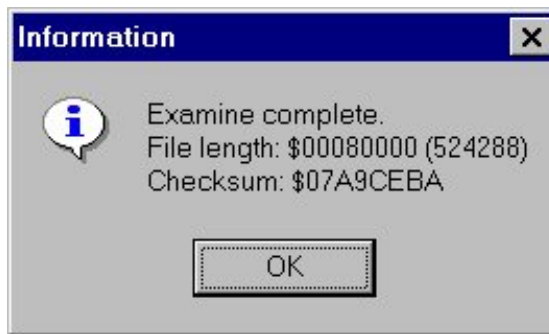
The File length is represented by hexadecimal value of the total number of bytes in the file. If you are not familiar with hexadecimal numbers, refer to the table below.

File Length	Start address	End address
$1000	00000	00FFF
$2000	00000	01FFF
$4000	00000	03FFF
$8000	00000	07FFF

The end of the file address is always one less than the file length. It is recommended that the user enter address 00000 as the start address.

```
>RECEIVE BINARY
00000,07FFF
```

If the *S4 Validator* is set up to receive Binary (or ASCII) files, the above message will appear on the S4 driver screen. The first parameter relates to the Start address (00000) and the second address is the end address. When the user hits return on the PC keyboard the file will be transmitted to the *S4* Validator's user ram and once finish, the data will reside between the start and ending address as entered.

Printing the Signature

In order to print the *S4 Validator* signature to a printer there are several things you will require. First, you **must** have the Seiko DPU-H245AS thermal printer. The *S4 Validator* software was specifically written for this printer and other printers will not work properly. Secondly, you must have the correct serial cable to interface the *S4 Validator* to the printer. Both the printer and cable are stock items and can be purchased directly from Dataman. Once you have the Seiko printer connected to the *S4 Validator* via the proper cable you are ready to begin.

In order for the printer to work properly, you must have the *S4 Validator* serial port set to a Baud rate of 9600. Please refer to the "Setting up the Serial Port" section on page 11 and make sure the Baud rate is set at 9600. The printer switches were pre-set to the necessary settings at the factory prior to shipping and should not be altered. If you experience printing problems, check to make sure the switches are set to the correct settings as follows:

DIL Switch	Position
1	Down (On)
2	Down (On)
3	Up (Off)
4	Up (Off)
5	Up (Off)
6	Down (On)

These switches are used to set the printer for 8 bits data, no parity and 9600 Baud rate.

These switches are located next to the RS232 connector on the left side of the printer.

If you are still experiencing problems, make sure you are using the cable that came with the printer and that it is properly connected to the *S4 Validator*. If you are using your own cable, make sure your cable is properly wired using the following pin-out:

S4 Validator DB25 Male	Signal	Printer DB9 Male
Pin-3	(Data)	Pin-3
Pin-4	(Handshake)	Pin-8
Pin-7	(Ground)	Pin-5

All other pins are NC (not connected)

It is <u>very important</u> that you follow the correct sequence when connecting the printer to the *S4 Validator*. Failure to do so will cause framing print errors. These print errors will appear as **?** when attempting to print. If you are getting these errors, make sure you perform the following steps in the sequence listed below:

- Make sure both the *S4 Validator* and the printer are turned off.

- Connect the serial cable to both the printer and the *S4 Validator*.

- Turn on the *S4 Validator* first, then turn on the printer.

To validate your device, press the green SUM button (refer to the "How to use the S4 Validator" section on page 3). Once your signature has been calculated and displayed on the *S4 Validator,* perform the following steps:

To print the signature displayed, press the **DUMP** button. The screen should appear as follows:

```
>Print signature
 Date:    --/--/----

```

Now enter today's date on the *S4 Validator* keypad using the ***MMDDYYYY*** format. After the date has been entered, press ENTER. The screen should appear as follows with the date you just entered:

```
>Print signature
 Date:    03/01/2000
 House #: --------
```

Now enter the Machine House Number using the *S4 Validator* keypad and press ENTER. Depending on which Library you have loaded, you should see one of the following screens appear:

```
Printing CRC-32..
>
```

```
Printing SHA-1..
>
```

After you have completed the above step, the printer should print today's date, the machine house number, and your signature (either the 8- character or the 40-character signature, depending on which library is loaded).

If the printer is not ready, not connected, or there is any kind of communication problem with the printer, you will get the following error message:

```
Checking printer..
```

```
Printer not ready.
>
```

After you have resolved the problem, or if you want to print another copy of the signature, press the DUMP button and repeat the process again. Every time you want a copy of the signature and press the DUMP button, you will need to re-enter the date and machine house number.

Important Notes

If Validator Shows No Signs of Life

If the *S4 Validator* has not been used for an extended period of time, you may find that the batteries have become discharged. The *S4 Validator's* charging circuit is microprocessor controlled and therefore needs to be powered-up for the charger to actually charge the batteries. Leaving the charger plugged in will not automatically recharge the batteries and since it is not an AC adapter, doing so has no benefit. The only way to jump-start the *S4 Validator* when the batteries are flat is to manually override the microprocessor controlled charging system as described below.

Locate the ON/OFF switch on the left side of the *S4 Validator*. Turn the power switch on by pushing it away from you. If there is nothing in the display, rotate the thumbwheel on the left side away from you to increase the contrast. If still nothing is visible, your batteries may have become completely discharged. Getting the *S4 Validator* to power up when the batteries are flat can be difficult, but can usually be accomplished using the following procedure;

- Push the *S4 Validator* power switch to the off or down position.

- Locate your charger and plug it into the socket located on the bottom right side of the *S4 Validator*.

- Push and hold in the **RESET** button for approximately 30 seconds. The **RESET** button is accessed through the small hole located next to the ON/OFF switch. Use a fine point pen/pencil or a paper clip to reset the *S4 Validator.* Do not press hard, the reset is a push button switch with short travel.

- Release the **RESET** button and push the power switch to the on or up position.

- The display should read "Start Library?". Press the **ENTER** button. Your current library should now be displayed.

- Press the **INFO** button and make sure that your charger is being sensed and that it is turned on. If it is not turned on, press the **RIGHT ARROW** button, this will manually turn on your charger.

- Once the charger has been manually turned on, push the power switch to the off or down position. Your display should now read "Will switch off when charging completed".

- When your display goes blank, unplug your charger. Your *S4 Validator* is now fully charged and ready for use.

If performing the above procedure fails to start the *S4 Validator* please contact Dataman for Technical Support.