Displaying Overhead Bytes

Victoria Combo enables you to view Overhead Bytes of STM-16/OC-48 and STM-64/OC-192 traffic. This is particularly useful in fault-finding on a network.

This Application Note describes how to display overhead bytes, and provides some explanation of the purpose of the Overhead Bytes.

Application Note Combo OH

Testing the World's Digital Networks

TrendCommunications

Displaying Overhead Bytes

Victoria Combo enables you to display the Overhead Bytes of STM-16/OC-48 and STM-64/OC-192 signals. This can be useful when you are performing advanced fault-finding on a network.

Victoria Combo can display the Overhead Bytes that are being transmitted and received by the tester on the screen at the same time in separate windows. This means that it is very easy to send a stimulus into the network and see if the received Overhead Bytes change in reaction to the stimulus.

If you are testing on a STM-64/OC-192 network you can also set up a trigger so that specific bytes you choose are automatically captured when a condition is met. This enables you to review the captured bytes later. Capturing the Overhead Bytes means that you can analyse SOH and POH bytes. Overhead Bytes can change very rapidly and capturing the bytes means that you can look at the results carefully after the capture has finished. This means that you can see changes that may have otherwise been missed.

Displaying the Overhead Bytes of a STM-16 Signal

Victoria Combo displays the Overhead Bytes of the STM-16 signal on different OH pages. You can display the different pages by touching the arrows next to the *OH Page Number*. Each OH page corresponds to the overhead in each one of the 16 STM-1/OC-3 tributaries that make up an STM-16/OC-48 frame, or the 4 STM-1/OC-3 tributaries that make up an STM-4/OC-12 frame, or the STM-1/OC-3 frame. The value of the *OH Page Number* goes from 1 to 16, 4 or is fixed to 1, respectively for the different types of traffic.

The columns displayed on the pages depend on the mapping configuration. The bytes transporting messages are highlighted by labelled buttons. To display the messages:

1. Touch the button you want to display the message for.
Two windows can be displayed:

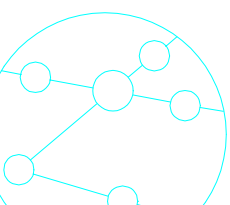
- messages carried by the SOH/LOH bytes C1, K1 and K2 and S1,

and

- messages carried by the higher order path/STS-path OH bytes C2, G1, H4 and K3/Z3

or

- the lower-order path /VT-path OH bytes V5 and K4/Z7.



For example, the K1 byte used for Automatic Protection Switching displays a window with its hexadecimal value and a description of the function programmed in the *Overhead Bytes Setup* window. In this particular case the *APS topology* of the network (*Ring* or *Linear*) is also displayed. For more information see *Understanding the Results* on page 7.

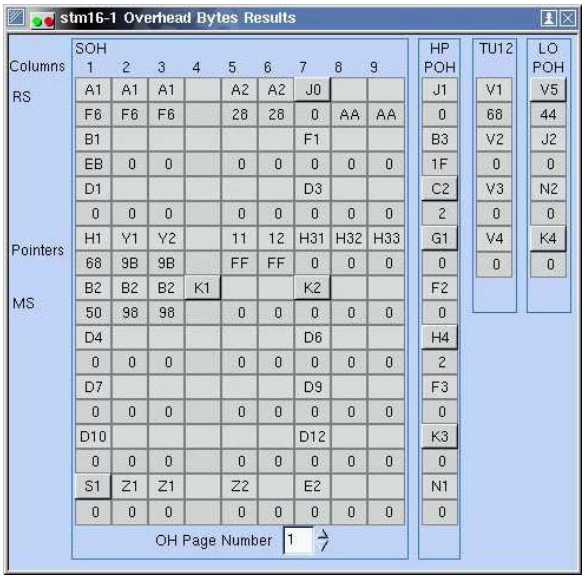


Figure 1.1 Overhead Byte Results

Displaying the Overhead Bytes of a STM-64 Signal

Victoria Combo displays the Overhead Bytes of the STM-64 signal on different OH pages. You can display the different pages by touching the arrows next to the *OH Page Number*.

Victoria Combo enables you to capture the Overhead Bytes in different ways:

- display all the OH Bytes continuously - *Continuous*;
- start and stop capture when you click on a button - *Manual*;
- start a capture when an event occurs - *Trigger*.

To display the *Overhead Byte Results* window:

1. From the *Instant Results* menu choose *Overhead Byte Results*, then choose *Open*.
   The *Overhead Byte Results* window is displayed.

Each OH page corresponds to the overhead included in each one of the 64 tributaries that make up an STM-64 frame[1]. The value of the OH Page Number goes from 1 to 64, this is to avoid confusion when viewing.

The columns displayed on the page depend on the mapping configuration. The bytes transporting messages are highlighted by labelled buttons. To display the messages:

1. Touch the button you want to display the message for.
There are two windows: one displaying messages carried by the SOH/LOH bytes C1, K1 & K2 and S1, and other displaying messages carried by the POH bytes C2, G1, H4 and K3.

Setting up Frame Capture

Victoria Combo enables you to program the capture of a number of frames to allow monitoring of all the overhead bytes, or some overhead bytes that you are interested in. To display the *Capture Setup* window:

1. From the *Instant Results* menu choose *Overhead Byte Results*, then choose *Capture Setup*, then choose *Open*.
The *Capture Setup* window is displayed.
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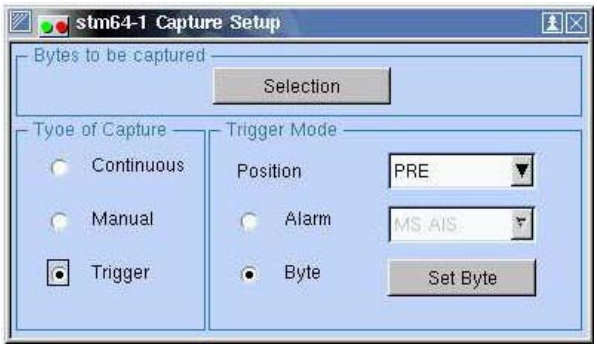


Figure 1.2 Programming capture in Victoria Combo

2. Choose the *Type of Capture* you want to perform:

- *Continuous*: displays all the frame overheads that the tester is receiving. If you choose *Continuous* capture, all the OH bytes will be displayed but not stored for review. No other settings are available in the *Capture Setup* window.
- *Manual:* captures the frames received starting from when you touch the *Activate* button in the *Overhead Byte Results* window. The frames can then be displayed after capture.

1.Or the 64 OC-3 tributaries in an OC-192 SONET signal

- *Trigger*: the tester begins to capture frames when a trigger condition occurs. This condition can be an alarm, or when the value of a pre-programmable byte equals a specific value. The frames can then be displayed after capture.

  If you have selected *Manual* or *Trigger* captures you can select the bytes that will be captured:

1. Touch *Selection*.
   Individual bytes are displayed in a table where the overhead bytes are arranged in rows and columns in the same way as the general OH bytes window.
2. To select the specific tributaries from which you want to capture the OH bytes select the *OH Page No.*
   Victoria Combo will capture a number of frames depending on the number of bytes selected.

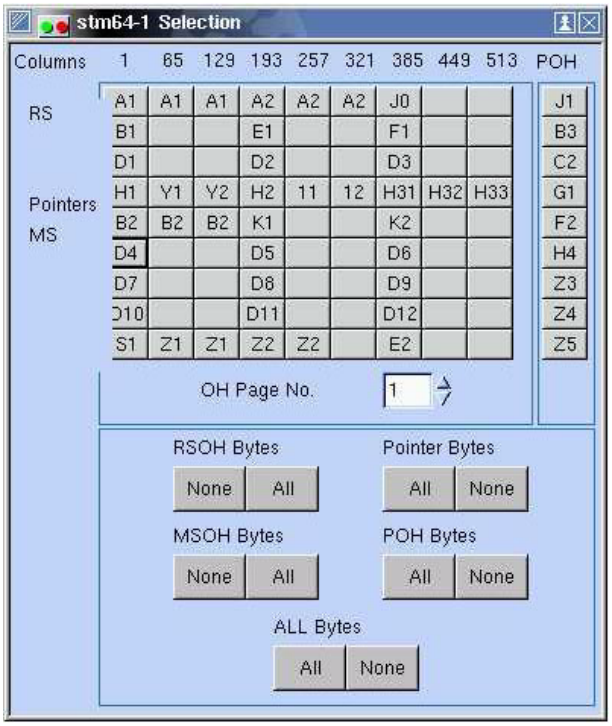


Figure 1.3 Selection of Overhead bytes to be captured

3. To choose the bytes you want to capture, touch the buttons for the bytes.
   Note that the selected bytes differ from the non selected ones because the buttons are shaded. You can also automatically select a group of significant bytes within the total overhead by touching the buttons *RSOH Bytes*, *MSOH Bytes*, *POHBytes* or *Pointer Bytes*.
4. If you want to perform a capture that is started by a trigger, select *Trigger* and define the *Trigger Mode*:

- *Pre-Trigger*: capture N frames before the trigger occurs.
- *Post-Trigger*: capture N frames after the trigger occurs.
- *Mid-Trigger*: capture N/2 frames before and N/2 frames after the trigger occurs.
- The trigger can be defined as the occurrence of an *Alarm* (MS-AIS, MS-RDI or AU-AIS) or the value of a *Byte*.
- To enter the Byte value touch *Set Byte*.
  The *Capture Trigger* screen is displayed.

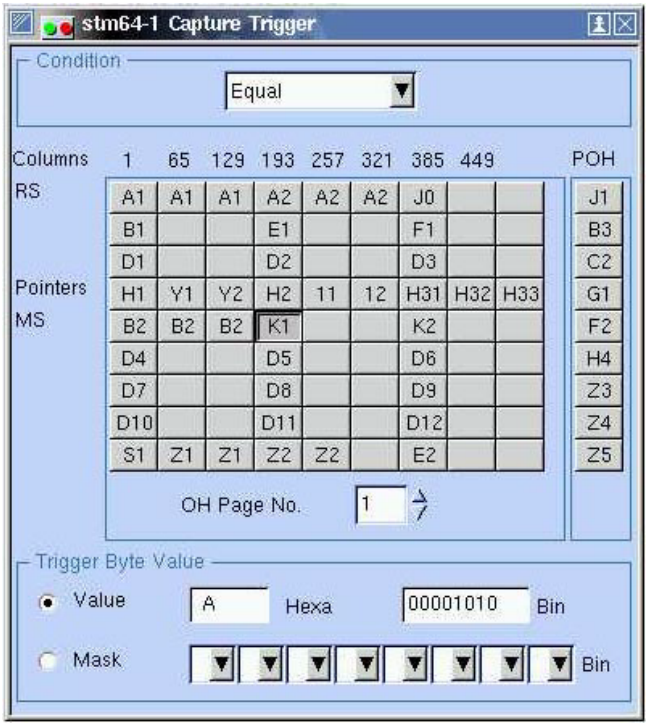


Figure 1.4 The Capture Trigger window

5. Define the *Condition* for the comparison (equal value, different value).
6. Enter the information about the trigger byte location using the OH map and the *OH Page Number*.
7. Enter the *Trigger Byte Value* in hexadecimal or binary format or set some specific bits of the total byte by entering a binary *Mask*[2]. The trigger will be activated when a byte or a group of bits within the total byte captured is equal or different from the programmed byte (depending on what *Condition* you have set). The results of the Capture are displayed in the *Overhead Byte Result* window.
8. If you want to start a manual capture, touch *Activate* in the *Overhead Byte*

2.The value of the digit is irrelevant when an"X" appears. Values differing from "X" (1 or 0) generate trigger.

Results window.
When the capture has finished, the status message *DONE* is displayed.
For more information see *Understanding the Results* on page 7.

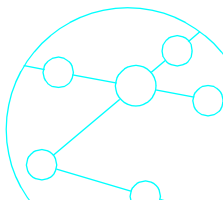
Understanding the Results

Section Overhead (SOH) bytes:

C1/J0	*Regenerator section trace:* This is used to transmit a 16- or 64-byte identifier (including a CRC-7 byte) repeatedly, so that every regenerator can verify its connection.
K1 & K2	*PS bytes:* They carry the APS protocol. See the APS Testing Application Note
S1	*Synchronization status messages:* This is used to inform the remote multiplexer on the quality of the clock used to generate the signals. 0x: Unknown, 2x: G811, 4x: G.812 transit, 8x: G.812 local, Bx: G.813, Fx: Not used for synchronization.

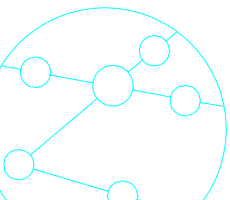
Higher order path/STS-path (HP POH) OH bytes:

C2	*Path signal label*: This indicates the composition or mapping of the VC-*n*. 0x: Unequipped, 01x: Reserved, 02x: TUG structure, 03x: Locked TU-*n*, 04x: 34-Mbps or 45-Mbps mapping, 12x: 140-Mbps mapping, 13x: ATM mapping, 14x: *distributed queue dial bus* (DQDB) mapping, 15x: *fiber distributed data interface* (FDDI) mapping, 16x: HDLC/PPP mapping, 17x: *simple data link* (SDL) mapping, 18x: Mapping of HDLC/LAPS, 19x: SDL mapping, 1Ax: 10 GbE, 1Bx: GFP mapping, CFx: Obsolete mapping of HDLC/PPP, from E1x to FC: reserved for national use, FEx: test signal O.181.
G1	*HP status and performance*: This byte enables continuous monitoring of anomalies and defects either at path end or at any point along the trail. Bits 1-4: remote error indication (HP-REI) conveys the number of bit errors detected by B3. Bit 5: remote defect indication (HP-RDI), is sent back if a signal failure is detected. Bits 6-7 can be used to provide enhanced RDI information to differentiate between payload defects (HP-PLM), server defects (HP-AIS, LOP), and connectivity defects (HP-TIM, HP-UNEQ).
H4	*Sequence indication for virtual VC-3/4 concatenation*: If the payload is VC-2, VC-12, or VC-11, it is used as a multiframe indicator.
$K3_{(bit1-4)}$	*APS signaling:* Allocated for the VC-3/4 protection protocol in case of a failure
$K3_{(bit7-8)}$	HP data communication channel of 16 Kbps.



Lower-order path/VT-path (LP POH) OH bytes

V5	*LP general overhead:* Its position is indicated by the TU-*n* pointer, and it provides path status, performance monitoring, and signal label functions for VC-2, VC-12, and VC-11 paths. This byte enables continuous monitoring of anomalies and defects, and payload composition either at path end or at any point along the trail.
$V5_{(bit1-2)}$	*LP bit error monitoring:* A BIP-2 is calculated by the transmitter over all the bits of the previous VC-*n*. The calculation includes POH bytes, but excludes V1, V2, V3 (except when used for negative justification), and V4.
$V5_{(bit3)}$	*LP remote error indication* (LP-REI): This is set to 1 and sent back towards an LP originator, if one or more bit errors is detected by the BIP-2.
$V5_{(bit4)}$	*LP remote failure indication* (LP-RFI), only VC-11: This is set to 1 and sent back if a failure is declared. Otherwise it is cleared (that is, set to 0).
$V5_{(bit5-7)}$	*LP signal label:* This indicates the payload composition. 0x: Unequipped, 1x: Reserved, 2x: Asynchronous, 3x: Bit-synchronous, 4x: Byte-synchronous, 5x: Extended signal label, see K4 bit 1, 6x: Test signal, O.181, 7x: VC-AIS.
$V5_{(bit8)}$	*LP remote defect indication* (LP-RDI): This is set to 1 and sent back towards the trail termination source if a failure condition is detected.
J2	*LP trace:* It carries on a configurable 16 sequence identifier (including a CRC-7 byte) so that the receiving path terminal can continuously verify its connection with the transmitter.
N2	*LP tandem connection monitoring function* (LP-TCM): Bits 1-2: BIP-2 for TC bit error checking; bit 3: fixed to 1, bit 4: incoming AIS indicator (I-AIS), bit 5: indicates errored blocks (TC-REI), bit 6: OEI to indicate errored blocks, bits 7-8: operate as a 76-multiframe string, including access point identifier (TC-APId), TC-RDI, and ODI.
$K4_{(bit1)}$	*Extended signal label* (if $V5_{(bit5-7)}$ are 5x): This is a 32-bit multiframed string. Bits 12 to 19 contain the label. 09x: ATM mapping, 0Ax: HDLC/PPP mapping, 0Bx: HDLC/LAPS mapping, 0Cx: test signal O.181 mapping, 0Dx: flexible topology data link mapping.
$K4_{(bit2)}$	*LP virtual concatenation*: A 32-bit multiframed string.
$K4_{(bit3-4)}$	*LP automatic protection switching channel* (APS).
$K4_{(bit5-7)}$	*LP enhanced remote defect indication*: Provides enhanced RDI information. 1x: no defect, 2x: payload defect (LP-PLM; loss of cell delineation or LCD), 5x server defects (LP-AIS, TU-LP), 6x: connectivity defects (LP-TIM, LP-UNEQ).
$K4_{(bit8)}$	LP data link.



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