Measurement Description
between Trigger Mode and Continuous Mode
And
Description of Continuous Mode

Revision Draft 1.1a

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History

June 17, 2003 .....First Release (Revision Draft 1.0)
June 20, 2003 ...Add Continuous Mode Description (Revision Draft 1.1)
July 14, 2003 .... Fix English Description, etc,.(Revision Draft 1.1a)

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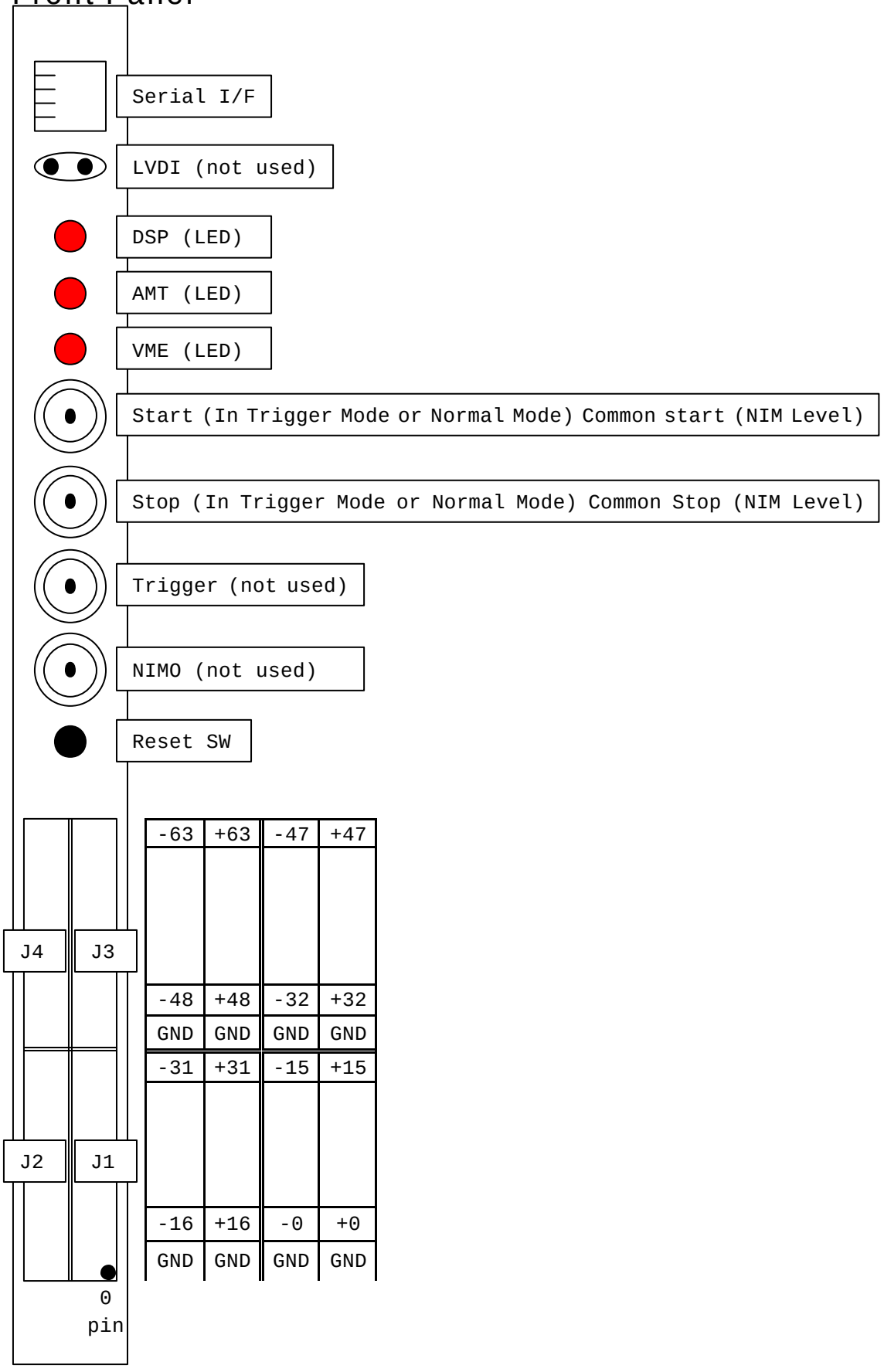
1. Front Panel



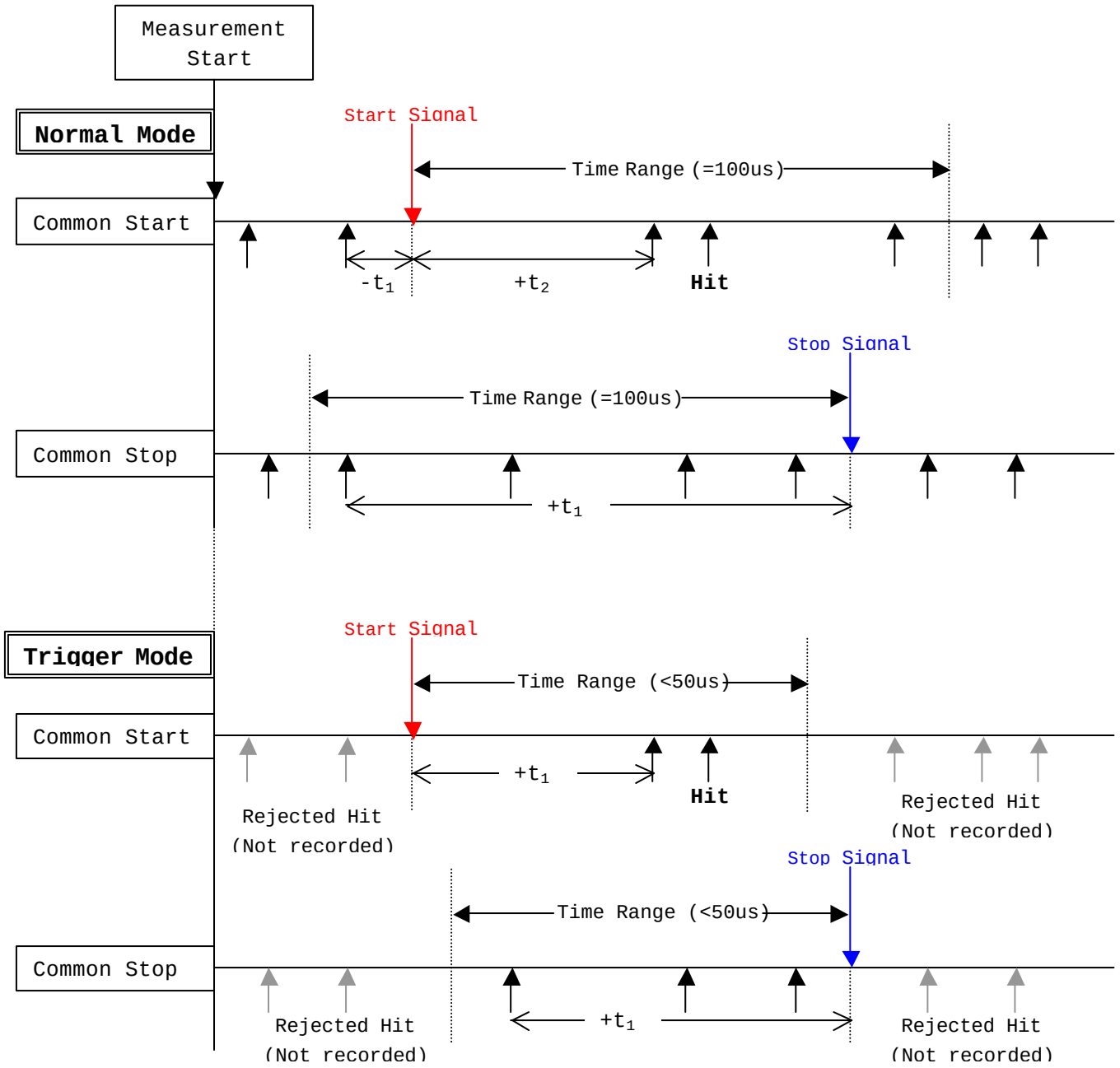
-63	+63	-47	+47
-48	+48	-32	+32
GND	GND	GND	GND
-31	+31	-15	+15
-16	+16	-0	+0
GND	GND	GND	GND

2. Difference bitween Normal Mode and Trigger Mode

In normal mode, data taking will start soon after the measurement start. Measurement will stop if time exceeds the time range or common stop signal arrives. All hit inputs after the measurement start are recorded. Since maximum time range in this mode is 100us, user must take care for the hit inputs outside the time range of which data may have (100us x N) offset. Common start and common stop signals are used as a time origin of data, from where time is calculated. Therefore time with minus value may appear in common start mode.

In trigger mode, time range is calculated from start (or stop) signal. Hit inputs within this time range are measured. Thus hit inputs outside of the time range are not recorded (rejected) even measurement is started.

2-1.



2-2.

Normal Mode Description

In this mode, DSP calculates all events in buffer. So, if you do not have any ways of confirm whether these events are into 100us period or old data or garbage data, you should not use Normal mode.

1) **Common Start .... Recording Data = Hit data - Start Signal**

ex) (correct caluculate)Recording Data = $+t_2$ - StartSignal

If there are still old hit data(or garbage) in Event buffer, DSP calculate below.

(wrong caluculate) Recording Data = $-t_1$ - StartSignal

2) **Common Stop .... Recording Data = StopSignal - Hit data($+t_1$)**

Trigger Mode Description

Almost same procedure with Normal Mode. But Each Measurement, Event Data is cleared.

(See more information at “Rev01a QuickOperationGuide.pdf”)

3. Continuous Mode (Preliminary)

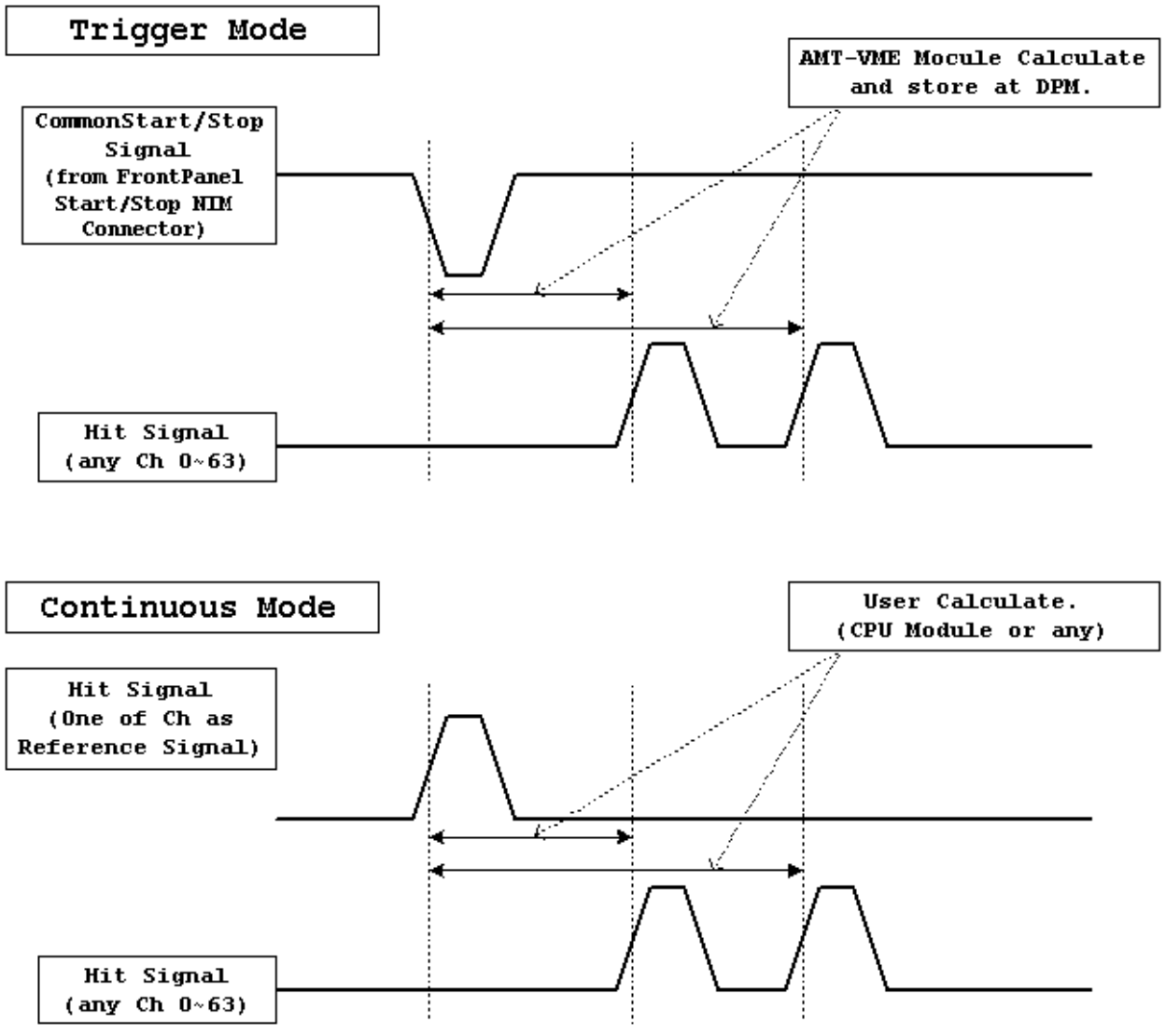
3-1. Overview

Caution : There is some deadtime in continuous mode, and this mode is not supported by AMSC Co.

While the Trigger Mode Measures Hit timing relative to the Start or Stop signal, the Trigger Mode limits the timing range to within 50usec(16bit), but in the continuous mode the limit is extended to 13msec(24bit) or more. User also can use a channel as a reference timing to calculate relative time to the reference signal by yourself. An illustration of these mode are shown in figure.

Although the time range can be greatly expanded in the Continuous Mode, but there is a limitation in the Hit input rate due to the processing power of the DSP. At present stage, the input rate is limited to 12 hits in 50usec.

table 3-1-1. Difference of Trigger Mode and Continuous Mode



3-2. Parameter Settings

Run Status

Bit31	(not used)
Bit30~28	(not used)
Bit27~9	(not used)
Bit8~7	measurement control 1or 0 = Trigger measurement/Normal measurement **2or3 = Continuous Mode**
Bit6~5	(not used)
Bit4~3	hit signal's edge detection (dedge) 0 = rising edge detect mode **(default)** 1 = rising and falling edge detect mode 2 = falling edge detect mode 3 = rising edge and width detect mode
Bit2	(not used)
Bit1	Measurement control 0 = measurement stop **(default)** 1 = measurement start
Bit0	(not used)

Time Range Count (not used)

Module ID

(not used)

CH_Enable (63~0 ch)

This parameter uses two 32-bit words. Each bit corresponds to each input channel. Input signal from disabled channels are not measured.

#63(MSB) - #0(LSB) **(default all'1')**

0 = disable

1 = enable

Example) 0xF00000 means ch 63~59 are enabled.

Number of Partitions (not used)

3-3. Continuous Mode Control Status Register

Continuous Mode is controlled by Memory Mapped Register on DPM.

table 3-3-1.Continuous Measurement Mode Memory Mapped Register

DSP Address	VME Address	Register Name
$8FF6	DPtop + $00EC	Continuous Measurement Mode Control Status

table 3-3-2. Continuous Measurement Mode Control Status Register

31	30 22	21 19	18	17	16
FOEV	Reserved	RCOUT	ERROR	EMPTY	FULL
RW, +0	R, +000 0000 00	R, +000	R, +0	R, +1	R, +0

15 0
DSIZE
R, +0000 0000 0000 0000

RW:Read and Write, R:ReadOnly, +0000:Default Value

table 3-3-3. Description of Continuous Measurement Mode Control Register Field

Field	Description
FOEV	Maximum distance between hit signal and next hit signal. FOEV = 0: 13.1ms below FOEV = 1: 13.1ms and above (*see section 6)
RCOUT	3 bit counter. RCOUT is counted up automatically at each renewal of this register.
ERROR	When DSP Event Buffer overflow, this bit is set.
EMPTY	When DSP Event Buffer empty, this bit is set.
FULL	When DSP Event BUffer full, this bit is set.
DSIZE	Remaining number of data in DSP Event Buffer. (number of 16-bit words)

3-4. Buffer

In Continuous Measurement Mode, Recording Data Buffer functions as a Ring Buffer. Recording Data Buffer size is fixed to 24k words(0x6000). Scount is used as a Write Pointer.
Icount is used as a ReadPointer in this mode.

3-5. Sequence

(1) Check EMPTY bit. (Check Recording Data Buffer empty or not)
(2) If EMPTY = 1, wait until EMPTY = 0.
(3) If EMPTY = 0, read DATA from event address(Recording Data Buffer top address+ Icount)
(4) Add 2 to Icount. (increment Icount twice)
(5) When Icount = 0x6000, Clear Icount to zero.

<Sequence as C language>

```
while(EMPTY==0);

Readaddr = (unsigned long*)(DSPBufferTopAddr + *Icounter);
MasterBuffer = *Readaddr;

*Icounter = *Icounter + 2;
if(*Icounter==0x6000)*Icounter = 0;
```

***)Please also see sample program.**

3-6. Storing Format at DPM

table 3-6-1.Hit Data Format

31	30	29 22	23 0	
0	Falling /Rising	Ch #	Hit Data	
			Extended bits 7-bit 100us~13.1ms	17-bit 0~99us

table 3-6-2.Error Data Format

31	30 28	27 0
1	Reserved	AMT Chip Error Format

figure 3-6-3. DSP uses these conditons(Carry, Odd/Even, Spacer)

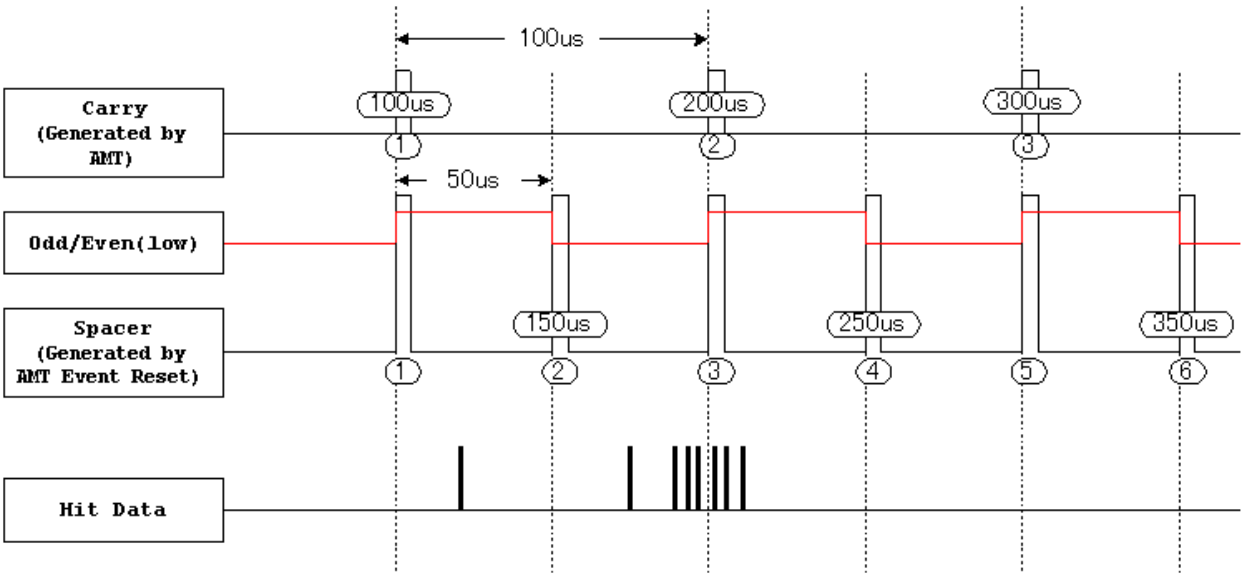


table 3-6-4. How to process with using these conditions and store Hit data format

Hit Data	Spacer	Carry
0x08000	1(odd)	1
0x1F000	2(even)	1
0x1FFF8	2(even)	1
0x00001	2(even)	1
0x00003	2(even)	1
0x1FFF8	3(odd)	2
0x00005	3(odd)	2
0x00010	3(odd)	2

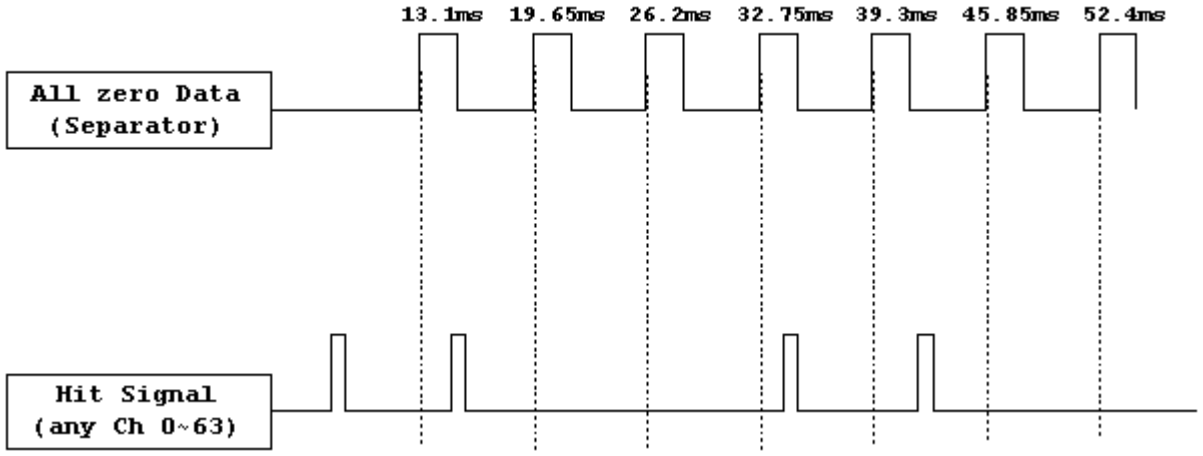
Extended Bit	0~23bit Hit Data
1	0x28000
1	0x3F000
1	0x3FFF8
2	0x40001
2	0x40003
1	0x3FFF8
2	0x40005
2	0x40010

DSP make Hit Data Format with using these conditions. Spacer changes state every 50us. So DSP has to finish making Hit Data Format within 50us.

3-7. Hit Signal distance above 13.1ms

Up to Master Module’s Memory size, AMT-VME Module can measure input timing semi-permanently. If you set FOEV bit at Continuous Mode Control Status Register, all zero data is written to Recording Data Buffer.
Writing of all zero Data timing is every 13.1ms(1 cycle of counter) and 6.55ms(half cycle of counter). But these timings are not accurate, timing margin is 0~3us.

figure 3-7-1. Sequence of Separator and Hit Signal



3-8. Performance

One Data(32bit) processing time is about **4us** until the data is stored to DPM.

(Important Notice)

We cannot make sure about input data accuracy, when over 12 hit signal during 50us period. It is possible that stored data is out of alignment about 100us.

Since the data processing power is limited to 12 hit/Module in 59usec period, the data may shift one cycle(~100 usec) if the rate is higher than this.