VME Intensity Monitor - Task #13919

Fix scaling for ring pick MPS thresholds

09/23/2016 10:46 AM - John Diamond

Status:	Assigned	**Start date:**	09/23/2016
Priority:	Normal	**Due date:**	
Assignee:	John Diamond	**% Done:**	80%
Category:	MPS	**Estimated time:**	8.00 hours
Target version:		**Spent time:**	10.00 hours

Description

The PXIE ring pickup MPS thresholds never made sense because they are set in ADC integrated counts. Ning has provided a method for scaling to amps -

```
Intensity Threshold ( P:MPRLT , P:MPRUT ):

I_THR: Register Value for thresholds.
Threshold_Setting: D80 Setting (common unit, E10?) for thresholds.
GW: Raw Gate Width Reading

Revised:
I_THR = log_base_C3( ( Threshold_Setting / ( GW * C5 ) - C4 ) / C1 ) * GW / C2

C1 = 0.3660774
C2 = 0.0003773625
C3 = 1.7
C4 = -0.268996

C5 = 4.9932073
C6 = 0

---- Note: the outside parts of this formula can be done on D80,
                Otherwise, leave D80 scaling to 1.
```

History

#1 - 09/23/2016 10:50 AM - John Diamond

The above formula scales to E10 not Amps.

#2 - 09/23/2016 11:03 AM - John Diamond

Gate Width should be the gate width as read from the digitizer in raw ADC clock ticks.

#3 - 09/23/2016 12:56 PM - John Diamond

I came up with the inverse function as -

```
  Threshold_Setting = (C5 * GW) * (C4 + C1 * C3^( (C2 * I_THR) / GW ))
```

#4 - 09/27/2016 09:13 PM - John Diamond

- % Done changed from 0 to 80

Implemented support for scaling the MPS upper/lower thresholds inside the front end.
Created a CLI command for specifying scaling parameters:

```
vmeintMPSThresholdScaleFilterSet deviceId, scaleMethodStr, c1Str, c2Str, c3Ctr, c4Str, c5Str, c6Str
```

- deviceId is the intensity device ID
- scaleMethodStr specifies what kind of scaling should be done. The default method is "linear". For the PXIE ring pickups this parameter should be "pxie_ring_pickup".
- c1Str .. c6Str are the scaling coefficients (these are floating-point parameters, they must be passed as strings e.g. "2.0")
  - **linear:** C1 * x / C2 + C3

- **pxie_ring_pickup:** log_base_C3((x / (GW * C5) - C4) / C1) * GW / C2

#5 - 09/27/2016 10:47 PM - John Diamond

Add a line of output to vmeintShow to display the MPS threshold scaling information:

```
Intensity Devices -
        Toroid
        Device ID: 0
        ADC ID: 0, channel: 0
        Readouts: BBB disabled, raw disabled
        DAQ Source: 0
        MPS: Enabled    NOT TRIPPED
                Lower: NaN, Upper: NaN, Edge Threshold: 4096
                Threshold Scaling: log_base_C3( (x / (gate_width * C5) - C4) / C1 ) * gate_width / C2, where C
1 = 0.366 C2 = 0.000377 C3 = 1.7 C4 = -0.26 C5 = 4.99 (pxie_ring_pickup)
                Pulse Direction: 0 (-)
                Pulse Width: 0 ns
                Time Check: Enabled, margin: 128 clock ticks
```