1 HUD Module Engineering Test Mode (ETM) – CGEA1.3

1.1 Functional Description

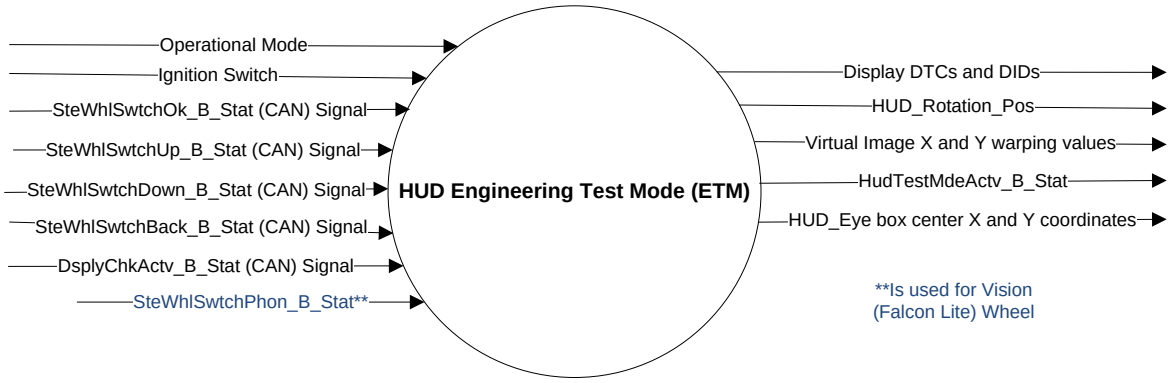
The HUD ETM function details the followings:

- HUD ETM entry requirements
- HUD ETM exit requirements
- HUD ETM functional requirements and performance

1.2 Interfaces

1.2.1 Interface Context Diagram (I/O Block Diagram)

Engineering Test Mode (ETM) Functional Context Diagram



1.2.2 Inputs

1.2.2.1 IR-REQ-305255/A-INTERNAL:

- Operational_Mode:

HUD Operational Mode

Mode	Differentiating Vehicle Conditions
Sleep Mode	Not Active
Limiting Mode	Not Active
Normal Mode	Active
Crank Mode	Active

1.2.2.2 HS3 CAN signals: (HUD Input Mux Messages)

1.2.2.2.1 SIG-REQ-305233/A-Ignition_Status

Signal Name	Size (bits)	Detail	Units	Res	Offset	State Encoded	Min	Max
Ignition_Status	4		SED	1	0		0x0	0xF
		Unknown				0x0		
		Off				0x1		
		Accessory				0x2		
		Run				0x4		
		Start				0x8		
		Invalid				0xF		

1.2.2.2.2 SIG-REQ-305235/A-SteWhlSwtchOk_B_Stat

Signal Name	Size (bits)	Detail	Units	Res	Offset	State Encoded	Min	Max
SteWhlSwtchOk_B_Stat	1		SED	1	0		0 (0x0)	1 (0x1)
		Button_Not_Pressed				(0x0)		
		Button_Pressed				(0x1)		

1.2.2.2.3 SIG-REQ-305237/A-SteWhlSwtchUp_B_Stat

Signal Name	Size (bits)	Detail	Units	Res	Offset	State Encoded	Min	Max
SteWhlSwtchUp_B_Stat	1		SED	1	0		0 (0x0)	1 (0x1)
		Button_Not_Pressed				(0x0)		
		Button_Pressed				(0x1)		

1.2.2.2.4 SIG-REQ-305239/A-SteWhlSwtchDown_B_Stat

Signal Name	Size (bits)	Detail	Units	Res	Offset	State Encoded	Min	Max
SteWhlSwtchDown_B_Stat	1		SED	1	0		0 (0x0)	1 (0x1)
		Button_Not_Pressed				(0x0)		
		Button_Pressed				(0x1)		

1.2.2.2.5 SIG-REQ-305241/A-SteWhlSwtchBack_B_Stat

Signal Name	Size (bits)	Detail	Units	Res	Offset	State Encoded	Min	Max
SteWhlSwtchBack_B_Stat	1		SED	1	0		0 (0x0)	1 (0x1)
		Button_Not_Pressed				(0x0)		
		Button_Pressed				(0x1)		

1.2.2.2.6 SIG-REQ-305243/A-DsplyChkActv_B_Stat

Signal Name	Size (bits)	Detail	Units	Res	Offset	State Encoded	Min	Max
DsplyChkActv_B_Stat	1		SED	1	0		0 (0x0)	1 (0x1)
		Inactive				(0x0)		

		Active				(0x1)		

1.2.2.2.7 SIG-REQ-305245/A-SteWhlSwtchPhon_B_Stat

Signal Name	Size (bits)	Detail	Units	Res	Offset	State Encoded	Min	Max
SteWhlSwtchPhon_B_Stat	1		SED	1	0		0x0	0x1
		Not_Pressed						
		Pressed						

1.2.3 Outputs

1.2.3.1 IR-REQ-306244/A-Internal

- Display DIDs
- Display DTCs
- HUD_Rotation_Pos
- HUD_eye box center X coordinates
- HUD_eye box center Y coordinate
- HUD_ Virtual Image X and Y warping Values

1.2.3.2 HS3 CAN signals: (HUD Output MUX Message)

1.2.3.2.1 SIG-REQ-306279/A-HudTestMdeActv_B_Stat

Signal Name	Size (bits)	Detail	Units	Res.	Offset	State Encoded	Min	Max
HudTestMdeActv_B_Stat	1		SED	1	0		0 (0x0)	1 (0x1)
		Inactive				(0x0)		
		Active				(0x1)		

1.2.4 ETM Mode Entry Requirements

1.2.4.1 DIS-REQ-305251/A-Enable ETM

ETM is enabled; the configuration DID DE00, byte 5, bit 5 is enable (0x1)

1.2.4.2 DIS-REQ-305253/A-Ignition Status - Run

And when the Ok button has been pressed (the signal: SteWhlSwtchOk_B_Stat (0xPressed)) and the ignition status has been in run (the signal: Body_Info_HS3 -0x3B2 (Ignition status (0x4-Run)) and both have been received for the duration of Tpress = 10Sec, the HUD shall Display 'ETM' in the upper left of HUD image. If the user releases the Ok button within 5 seconds of ETM being displayed, HUD shall enter the ETM mode and transmit the CAN signal: HudTestMdeActv_B_Stat (0x1-Active). See Appendix A, HUD ETM Entry/Exit Requirements. If the Ok button has not been released while 10Sec ≤ Tpress ≤ 14Sec, the HUD shall remove the ETM text.

1.2.4.2.1 DIS-REQ-305247/A-Vision Steering Wheel

If the vehicle is equipped with the Vision Steering Wheel (Vision_Wheel Switch_Cfg = Enabled), the Phone Button (signal: SteWhlSwtchPhon_B_Stat) shall be used instead of the “Ok button (signal: SteWhlSwtchOk_B_Stat (0xPressed) to enter ETM Mode

The Display ETM text shall have the following characteristics:

- Font type and color: Lincoln Gold (0xAF9E73FF)
- Font size: a choice of 34pt, 28pt or 22pt
- Text location: text will be Left Justified and the upper left hand corner of the Text bounding box will be at coordinate (0,0) of the 800 x 200 display area which is the upper left hand corner of the display area.

1.2.4.3 DIS-REQ-305257/A-ETM mode entrance

Upon ETM mode entrance, the HUD shall center the projected image horizontally, vertically and rotationally

1.2.5 ETM Mode Exit Requirements

1.2.5.1 DIS-REQ-305259/A-HUD shall exit the ETM mode

HUD shall exit the ETM mode upon an ignition cycle (Ignition_Status <> 0x4). Upon terminated of the ETM mode, HUD shall transmit the CAN signal: HudTestMdeActv_B_Stat(0x0-Inactive) to the IPC. See Appendix A, HUD ETM Entry/Exit Requirements.

1.2.5.2 DIS-REQ-305261/A-SteWhlSwtchBack

Upon the reception of the SteWhlSwtchBack_B_Stat(0xPressed) CAN signal while the main menu is displayed. HUD shall exit the ETM mode, within 100msec.

1.2.5.3 DIS-REQ-305263/A-Terminated of the ETM mode

Upon the terminated of the ETM mode, HUD shall transmit the CAN signal: HudTestMdeActv_B_Stat(0x0-Inactive) to the IPC. See Appendix A, HUD ETM Entry/Exit Requirements.

1.2.6 ETM Cease/Resume Requirements

1.2.6.1 DIS-REQ-305687/A-ETM Activities Cease:

HUD shall Cease all ETM activities and ignore all SCCM button presses upon the reception of the CAN signal: DsplyChkActv_B_Stat (0x1-Active). HUD shall display “ETM mode is inactive for cluster controls. Clear cluster warnings to reactivate ETM mode”. See Appendix A, HUD ETM Mode Cease/Resume Requirements.

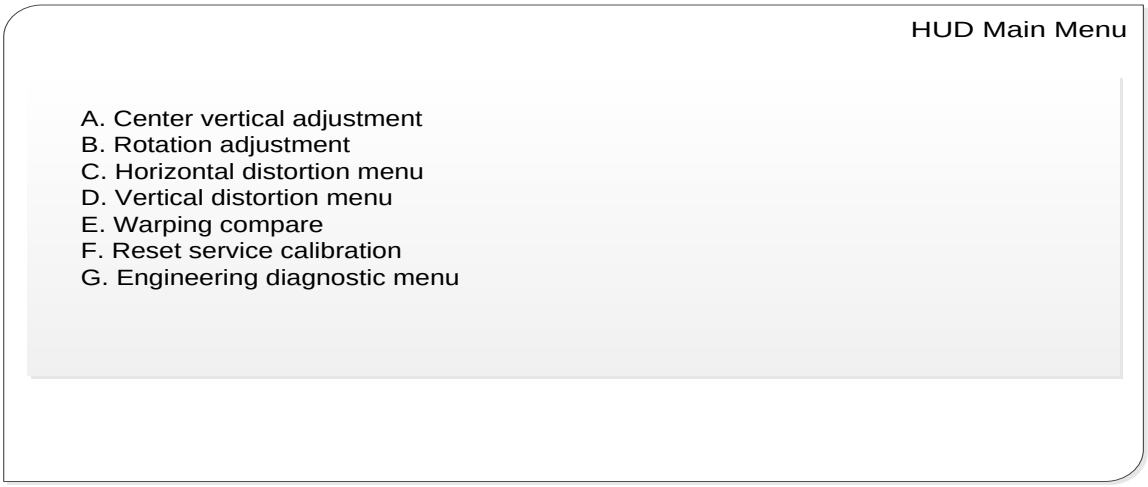
1.2.6.2 ETM Entry Action Requirements

1.2.6.2.1 DIS-REQ-305108/A-HUD Disclaimer Menu

Once the HUD module enters the ETM Mode, HUD ETM shall Display the following disclaimer:

1.2.6.2.2 DIS-REQ-305686/A-HUD Main Menu

Once is user presses Ok form the disclaimer menu, HUD shall display the following menu:



1.2.6.3 Main menu Scroll Up or Down

1.2.6.3.1 DIS-REQ-305681/A-ETM Previous menu:

Once ETM previous menu is displayed, the user shall have the ability to scroll up or down the ETM menu as follows:

- Scroll up, within 100msec, upon the reception of SteWhlSwtchUp_B_Stat(0xPressed)
- Scroll down, within 100msec, upon the reception of SteWhlSwtchDown_B_Stat(0xPressed). See DIS-REQ-305686.

1.2.6.3.2 DIS-REQ-305682/A-Top of the main menu

In the event that the top of the main menu is selected and scroll up event is received, HUD shall scroll to the bottom of the main menu

1.2.6.3.3 DIS-REQ-305683/A-Bottom of main menu

In the event that the bottom of the main menu is selected and scroll down event is received, HUD shall scroll to the top of the main menu. See DIS-REQ-305686.

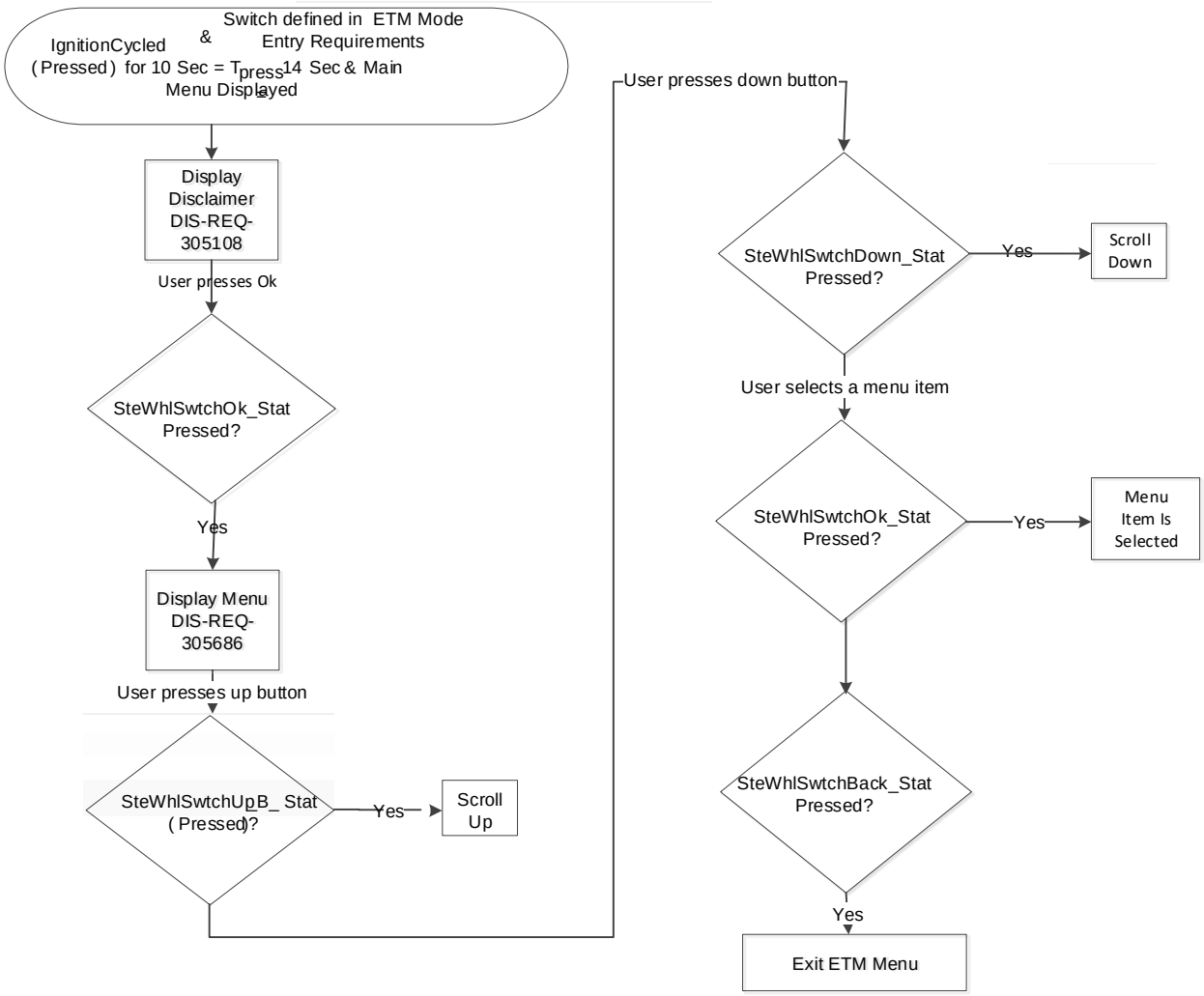
1.2.6.3.4 DIS-REQ-305684/A-HUD sub menu

In the event that the SteWhlSwtchOk_B_Stat(0xPressed) CAN signal is received, HUD shall enter the selected item sub menu within 100 msec. See DIS-REQ-305686.

1.2.6.3.5 DIS-REQ-305685/A-HUD exit from ETM

In the event that the SteWhlSwtchBack_B_Stat(0xPressed) CAN signal is received, HUD shall exit the ETM mode. See DIS-REQ-305686.

1.2.6.3.5.1 DIS-REQ-305680/A-Scroll Up or Down Logic Flow



1.2.6.4 ETM Sub Menu Entry Action Requirements

1.2.6.4.1 DIS-REQ-305634/A-Sub menu form the main menu

Once the user selects the sub menu form the main menu by scrolling up or down and presses the HUD Ok button, HUD shall enter the selected sub menu mode, within 100msec

1.2.6.4.2 DIS-REQ-305630/A-ETM mode entrance

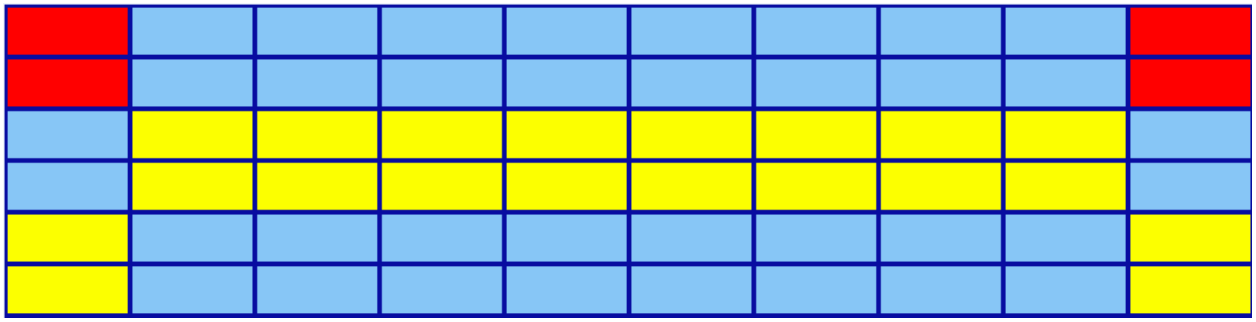
Upon ETM mode entrance, the HUD shall center the projected image horizontally, vertically and rotationally

1.2.6.4.3 DIS-REQ-305631/A-Eye box center vertical adjustment

If the selected sub menu item is “Eye box center vertical adjustment”, HUD shall display the following test chart, within 100 msec.

1.2.6.4.3.1 Eye Box

1.2.6.4.3.1.1 DIS-REQ-305604/A- Eye Box Center Vertical Adjustment HUDImageCenterAdjustment (HICA Chart Description)



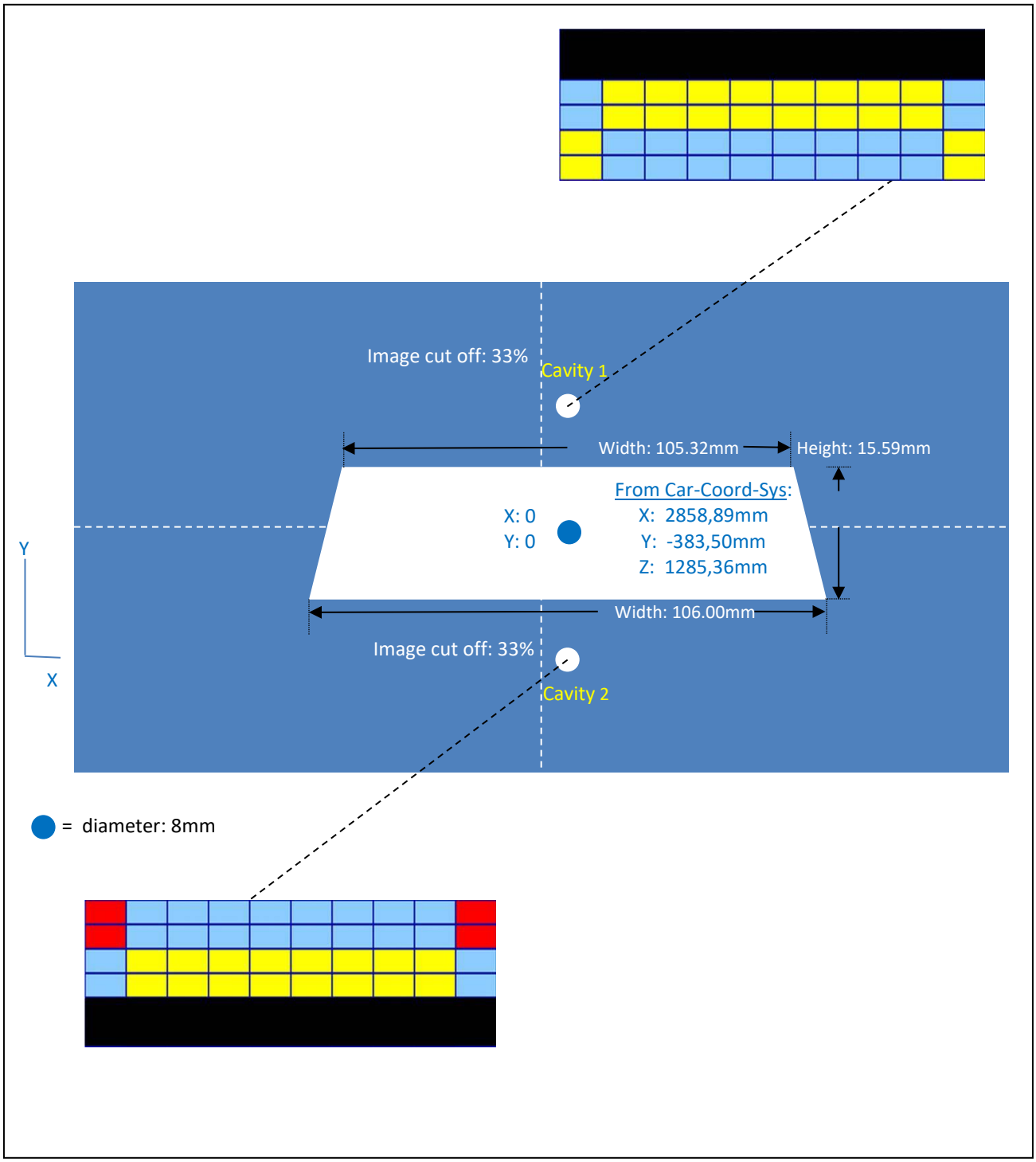
1.2.6.4.3.2 DIS-REQ-305618/A-Vertically adjusted center I

For perfectly vertically adjusted center, the adjuster shall look into the visor Image Cut Off (Cavity1) and see the 66% of the image of DIS-REQ-305608 (The Top 2 rows is not visible). See DIS-REQ-305605

1.2.6.4.3.3 DIS-REQ-305613/A-Vertically adjusted center II

For perfectly vertically adjusted center, the adjuster shall look into the visor Image Cut Off (Cavity 2) and see the 66% of the image of DIS-REQ-305608 (The bottom 2 rows is not visible). See DIS-REQ-305605

1.2.6.4.3.3.1 DIS-REQ-305605/A-Visor and Cavity Vertical Cavities Layout out



1.2.6.4.3.4 DIS-REQ-305628/A-Vertical adjustment

In the event that the above raw colors are not 100% visible, the HUD shall wait for either SteWhlSwtchUp_B_Stat (0xPressed) or SteWhlSwtchDown_B_Stat(0xPressed) CAN signals for vertical adjustment. See DIS-REQ-305605

1.2.6.4.3.5 DIS-REQ-305629/A-Center vertical move

The HUD shall implement a center vertical move repeat function; The HUD shall move the virtual image up or down as long as SteWhlSwtchUp_B_Stat (0xPressed) or SteWhlSwtchDown_B_Stat(0xPressed) status is received. HUD shall move the image at the rate of 150ms without wrap around

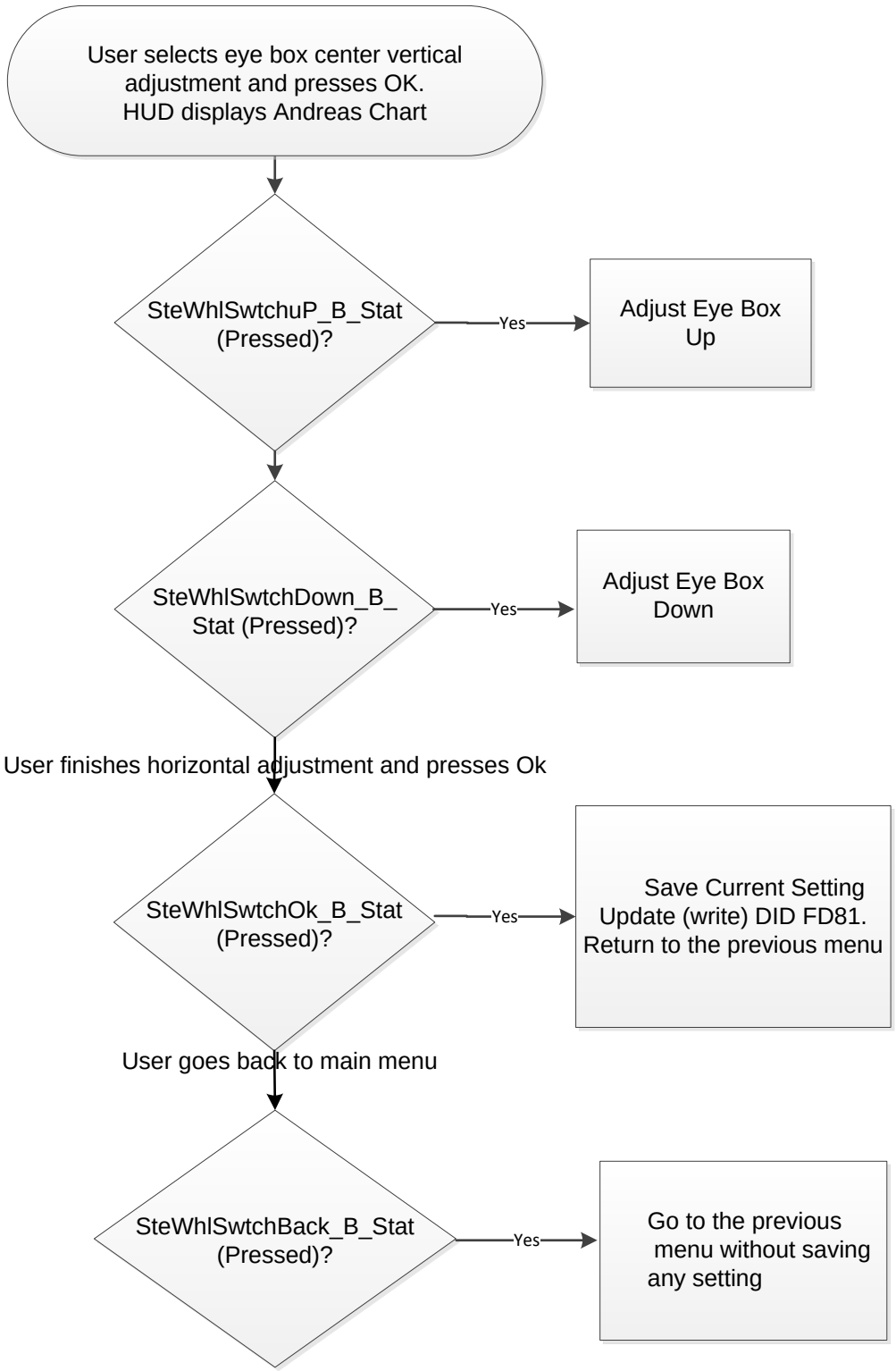
1.2.6.4.3.6 DIS-REQ-305611/A- Save current vertical setting

Once SteWhlSwtchOk_B_Stat (0xPressed) CAN signal is received, HUD shall Save current vertical setting and update the DID FD81 (Eye box vertical center position). See DIS-REQ-305607

1.2.6.4.3.7 DIS-REQ-305612/A-HUD shall return

HUD shall return to the previous menu (without saving any setting) upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100msec. See DIS-REQ-305607

1.2.6.4.3.7.1 DIS-REQ-305607/A-Eye Box Center Vertical Adjustment Logic Flow



1.2.6.4.4 DIS-REQ-305632/A-Eye box rotation adjustment

If the selected sub menu item is “Eye box rotation adjustment” HUD shall display the grid chart (See DIS-REQ-305620) and wait for either SteWhlSwtchUp_B_Stat (0xPressed) or SteWhlSwtchDown_B_Stat(0xPressed) CAN signals. See DIS-REQ-305608

1.2.6.4.4.1 DIS-REQ-305615/A-Rotation adjust repeat

The HUD shall implement a rotation adjust repeat function; The HUD shall rotate the virtual image clockwise or counter clockwise long as SteWhlSwtchUp_B_Stat (0xPressed) or SteWhlSwtchDown_B_Stat(0xPressed) status is received. HUD shall rotate the image at the rate of 150ms without wrap around

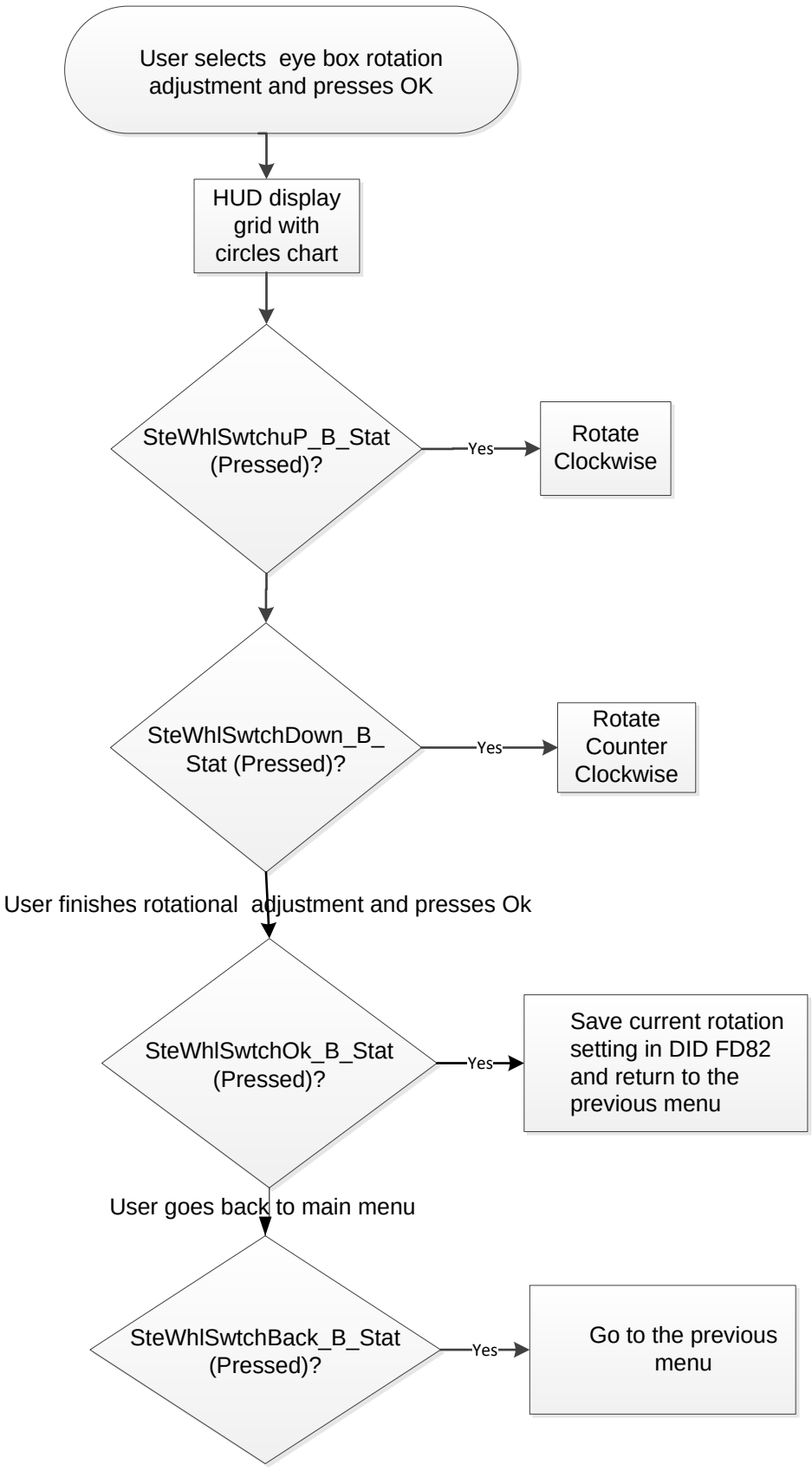
1.2.6.4.4.2 DIS-REQ-305616/A- Rotation DID

Once SteWhlSwtchOk_B_Stat(0xPressed) CAN signal is received, HUD shall save current rotation setting and update FD82 Rotation DID, within 100msec and exit to the previous menu. See DIS-REQ-305608

1.2.6.4.4.3 DIS-REQ-305617/A-Without saving any setting

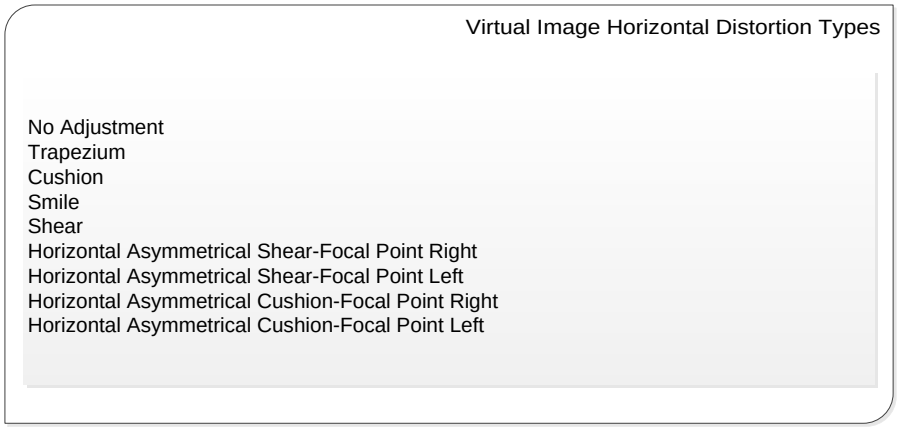
HUD shall return to the previous menu (without saving any setting) upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100msec.See DIS-REQ-305608

1.2.6.4.4.3.1 DIS-REQ-305608/A-Eye Box Rotation Adjustment Logic Flow



1.2.6.4.5 DIS-REQ-305633/A-Virtual Image Horizontal Distortion Correction Types

If the selected sub menu item is “Virtual image horizontal distortion correction menu”, HUD shall display the types of supported distortion menu within 100msec. See DIS-REQ-305633 below:



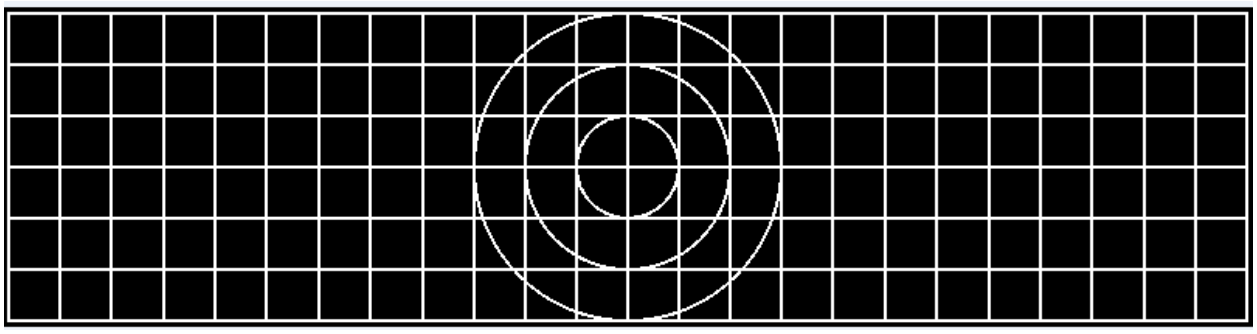
1.2.6.4.5.1 DIS-REQ-305619/A-Scroll up or down

The user shall have the ability to scroll up or down, DIS-REQ-305633, menu as follows:

- Scroll up, within 100msec, upon the reception of SteWhlSwtchUp_B_Stat(0xPressed)
- Scroll down, within 100msec, upon the reception of SteWhlSwtchDown_B_Stat(0xPressed)

1.2.6.4.5.2 DIS-REQ-305620/A-Distortion Correction Test Chart

HUD shall use the test chart of Figure 10 as the default test chart for distortion correction:



1.2.6.4.5.3 DIS-REQ-305621/A-Horizontal distortion

Once the user selects a horizontal distortion correction type, HUD shall display the grid with circles DIS-REQ-305620 test chart.

1.2.6.4.5.4 DIS-REQ-305622/A-Horizontal move repeat function

The HUD shall implement a horizontal move repeat function; The HUD shall move the virtual image in the right or left as long as SteWhlSwtchUp_B_Stat (0xPressed) or SteWhlSwtchDown_B_Stat(0xPressed) status is received. HUD shall move the image at the rate of 150ms without wrap around

1.2.6.4.5.5 DIS-REQ-305623/A-Virtual image horizontally

HUD shall correct the virtual image horizontally according the user selection from the above menu. See DIS-REQ-305609 and DIS-REQ-305610.

1.2.6.4.5.6 DIS-REQ-305624/A-X-warping

HUD shall calculate the X-warping table required for transforming the original virtual image old position into the new position.

1.2.6.4.5.7 DIS-REQ-305625/A-Horizontal Distortion Type DID Names

HUD shall update the DID that correspond to the selected distortion type as identified in table below:

DID Number	DID ID	DID Name
1	FD75	TrapeziumHorizontal
2	FD77	CushionHorizontal
3	FD83	SmileHorizontall
4	FD7A	ShearHorizontal
5	FD7C	AsymShearHorizontalRight
6	FD7D	AsymShearHorizontalLeft
7	FD7E	AsymCushionHorizontalRight
8	FD7F	AsymCushionHorizontalLeft

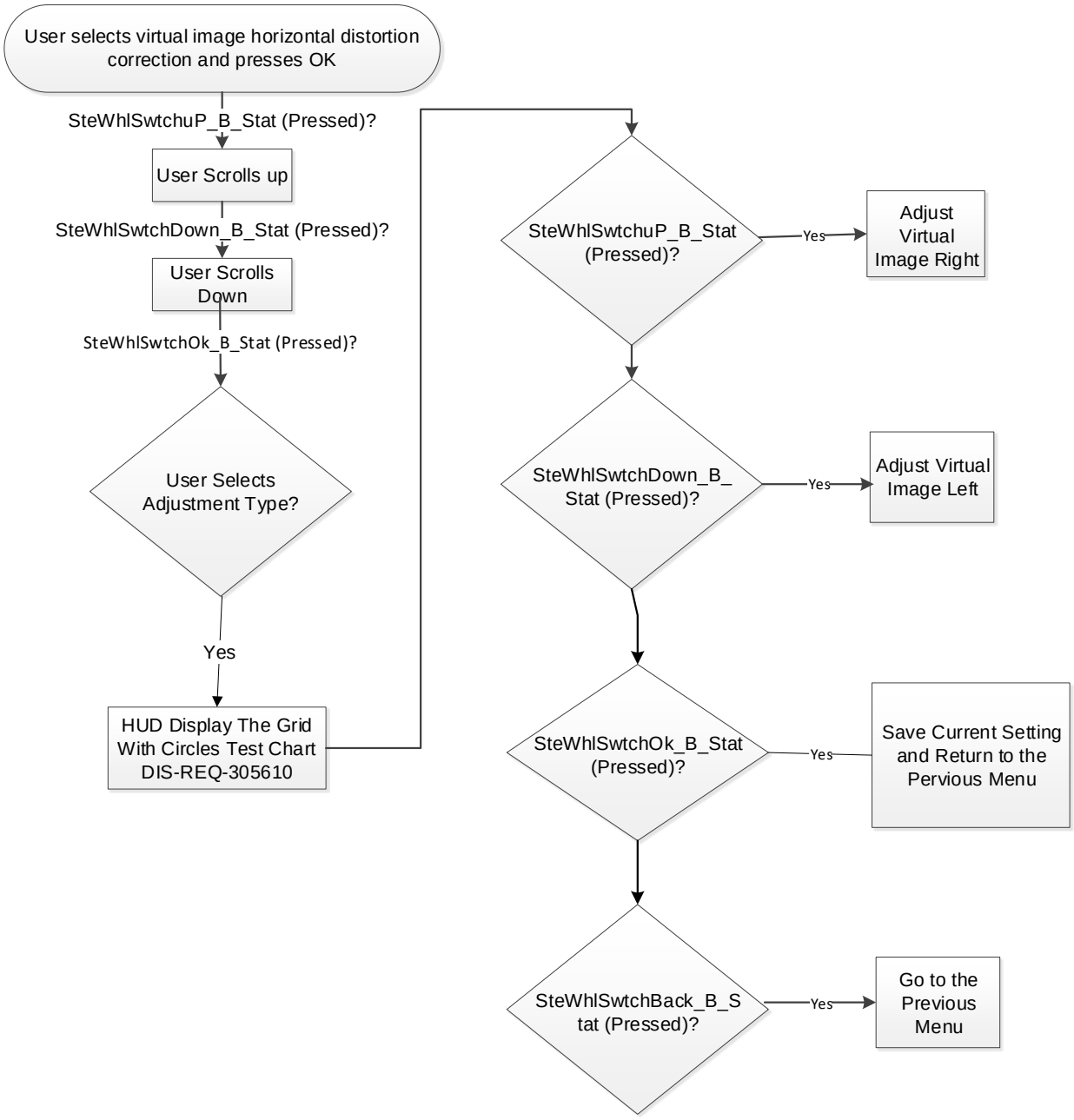
1.2.6.4.5.8 DIS-REQ-305626/A- Distortion setting

Once SteWhlSwtchOk_B_Stat(0xPressed) CAN signal is received, HUD shall save current distortion setting within 100msec. See DIS-REQ-305609 below

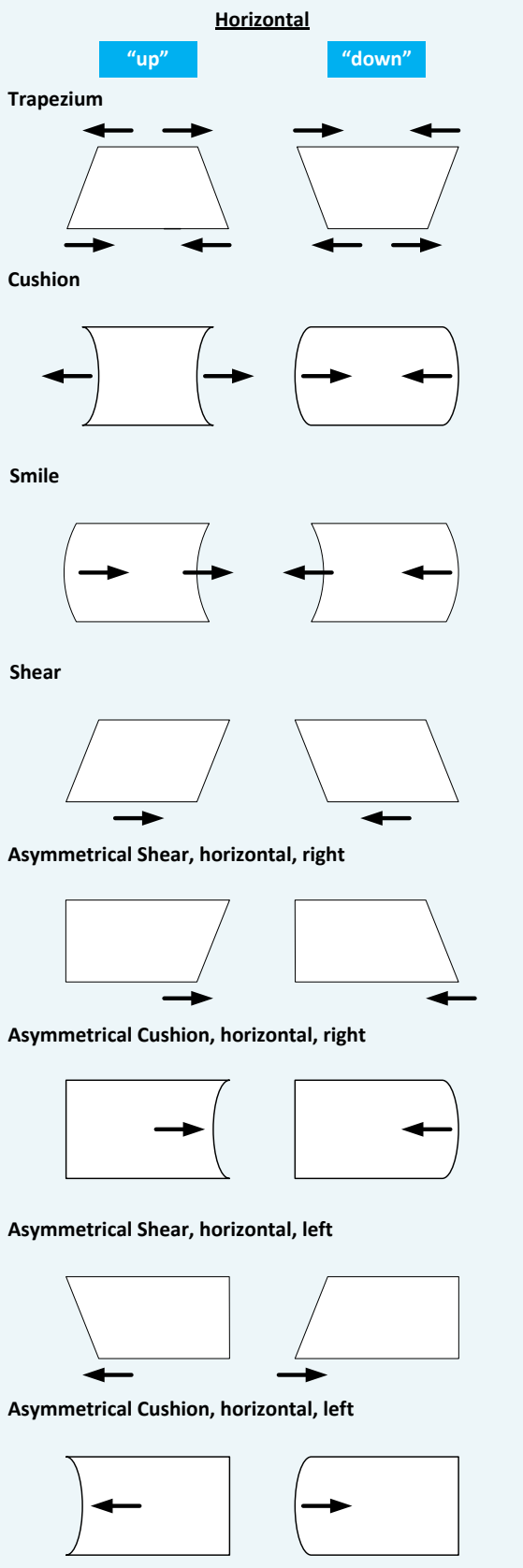
1.2.6.4.5.9 DIS-REQ-305627/A-Previous menu

HUD shall return to the previous menu (without saving any setting, upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100msec and return to previous menu. See DIS-REQ-305609 below

1.2.6.4.5.9.1 DIS-REQ-305609/A-Virtual Image Horizontal Adjustment Logic Flow



1.2.6.4.5.9.2 DIS-REQ-305610/A-Supported Horizontal Distortion Types



1.2.6.4.6 DIS-REQ-305646/A-Virtual Image Vertical Distortion Correction Types

If the selected sub menu item is “HUD virtual image vertical distortion correction”, HUD shall display the types of supported distortion within 100msec. See DIS-REQ-305646 below:

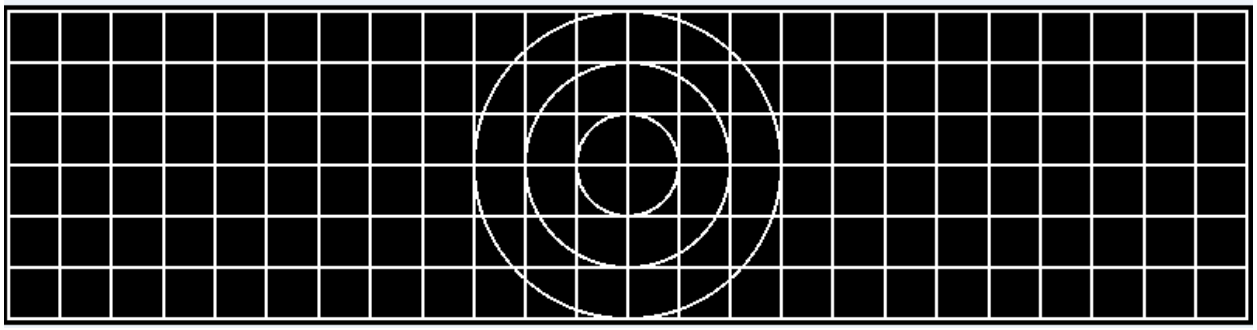
1.2.6.4.6.1 DIS-REQ-305644/A-Scroll up or down

The user shall have the ability to scroll up or down, DIS-REQ-305646 menu, as follows:

- Scroll up, within 100msec, upon the reception of SteWhlSwtchUp_B_Stat(0xPressed)
- Scroll down, within 100msec, upon the reception of SteWhlSwtchDown_B_Stat(0xPressed)

1.2.6.4.6.2 DIS-REQ-305645/A-Distortion Correction Test Chart

HUD shall use the test chart below as the default test chart for distortion correction:



1.2.6.4.6.3 DIS-REQ-305637/A-Vertical move repeat function

The HUD shall implement a vertical move repeat function; The HUD shall move the virtual image up/down as long as SteWhlSwtchUp_B_Stat (0xPressed) or SteWhlSwtchDown_B_Stat(0xPressed) status is received. HUD shall move the image at the rate of 150ms without wrap around

1.2.6.4.6.4 DIS-REQ-305638/A-Vertical distortion

Once the user selects a vertical distortion correction type, HUD shall display the grid with circles (DIS-REQ-305636) test chart.

1.2.6.4.6.5 DIS-REQ-305639/A-Virtual image

HUD shall correct the virtual image vertically according the user selection from the above menu, DIS-REQ-305636. See DIS-REQ-305635 and DIS-REQ-305636.

1.2.6.4.6.6 DIS-REQ-305640/A-Transforming

HUD shall calculate the Y-warping table required for transforming the original virtual image old position into the new position

1.2.6.4.6.7 DIS-REQ-305641/A-Vertical Distortion Type DID Names

HUD shall update the DID that correspond to the selected distortion type as identified in table below:

DID Number	DID ID	DID Name
1	FD76	TrapeziumVertical
2	FD78	CushionVertical
3	FD79	SmileVertical
4	FD7B	ShearVertical

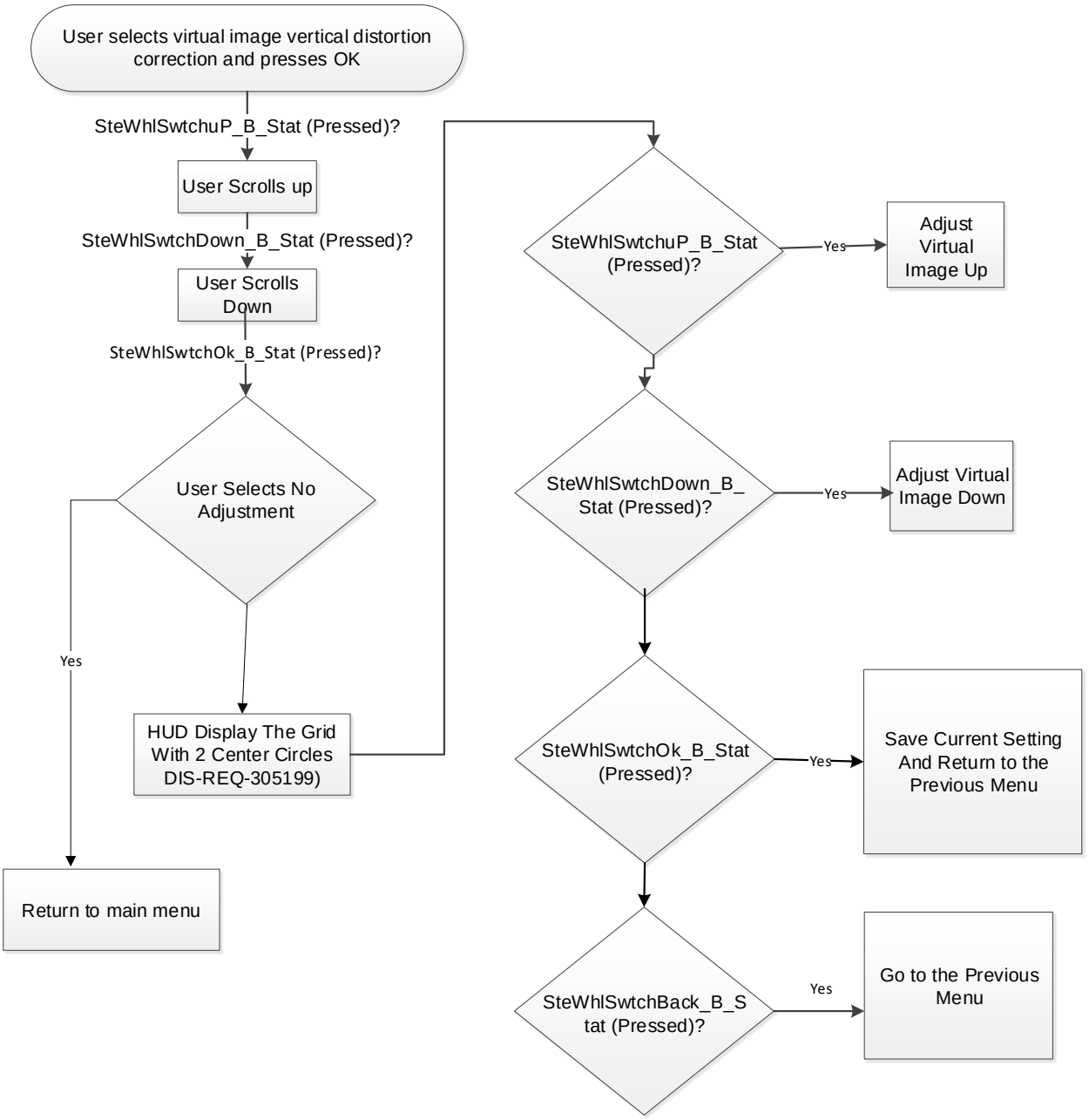
1.2.6.4.6.8 DIS-REQ-305642/A- Distortion setting

Once SteWhlSwtchOk_B_Stat(0xPressed) CAN signal is received, HUD shall save current distortion setting within 100msec and return to previous menu See DIS-REQ-305635 below

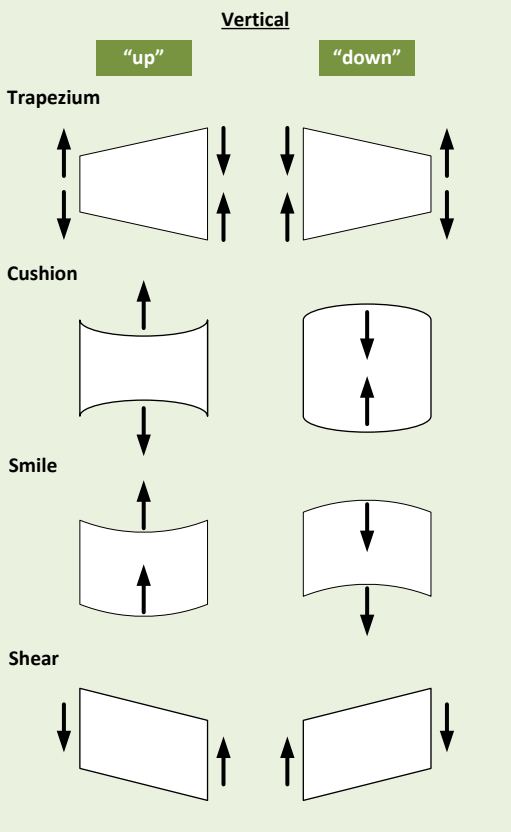
1.2.6.4.6.9 DIS-REQ-305643/A-Previous menu

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100msec. See DIS-REQ-305635 below

1.2.6.4.6.9.1 DIS-REQ-305635/A-Virtual Image Vertical Adjustment Logic Flow



1.2.6.4.6.9.2 DIS-REQ-305636/A-Supported Vertical Distortion Types



1.2.6.4.7 DIS-REQ-305647/A-Warping compare

If the selected sub menu item is “Warping compare”, upon the submenu entrance, HUD shall construct a warping mesh based on a supplier warping list:

1.2.6.4.7.1 DIS-REQ-305654/A-NVM warping switch

When supplier EOL NVM warping switch is off, Supplier shall use the ROM version of a warping list

1.2.6.4.7.2 DIS-REQ-305199/A-Supplier End of Line Calibration Chart

HUD shall display DIS-REQ-305199 chart (Supplier End of Line Calibration Chart).

1.2.6.4.7.3 DIS-REQ-305656/A-Service calibration is available

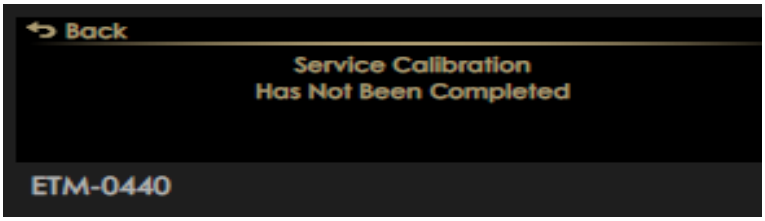
Once the HUD receives the signal SteWhlSwtchDown_B_Stat(0xPressed) while the chart of DIS-REQ-305199 being displayed, The HUD shall determine if the service calibration is available (available means when any one of the service parameter is non-zero).

1.2.6.4.7.4 DIS-REQ-305653/A-Service Calibration Chart

When service calibration is available, HUD shall display DIS-REQ-305653. The HUD shall construct a warping mesh based on supplier warping list plus the service calibration parameters. HUD shall not use Ford EOL calibration parameters

1.2.6.4.7.4.1 DIS-REQ-305650/A-Absence of Service Calibration Prompt

HUD shall display the following prompt (figure 19) if service calibration chart is not available.

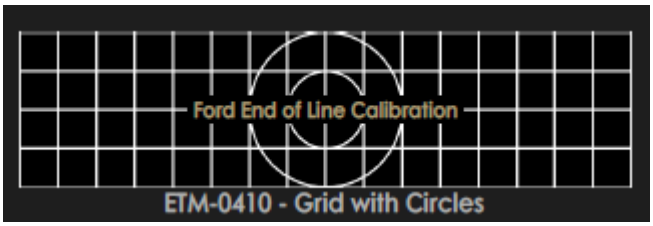


1.2.6.4.7.5 DIS-REQ-305655/A-Calibration chart or service calibration a prompt

While either the service calibration chart or service calibration a prompt (DIS-REQ-305199) is displayed, the reception of the CAN signal: SteWhlSwtchDown_B_Stat(0xPressed), HUD shall determine if Ford vehicle EOL is available (available means when the Ford vehicle EOL is enabled and any one of the Ford vehicle EOL parameter is non-zero).

1.2.6.4.7.6 DIS-REQ-305194/A-Ford End of Line Calibration Chart

When Ford vehicle EOL is available, HUD shall transition to display the Ford EOL chart (see below). Supplier shall construct a warping mesh based on Supplier EOL, service parameters and Ford vehicle warping lists.



1.2.6.4.7.6.1 DIS-REQ-305652/A-Absence of Ford EOL Calibration Prompt

HUD shall display the following prompt (below), when Ford EOL chart is not available:

1.2.6.4.7.7 DIS-REQ-305195/A-Calibration prompt

While either the Ford EOL chart or the absence of Ford EOL calibration prompt (DIS-REQ-305199) is displayed, HUD shall ignore the reception of the CAN signal: SteWhlSwtchDown_B_Stat(0xPressed)

1.2.6.4.7.8 DIS-REQ-305196/A-Supplier EOL calibration chart

Once the HUD receives the signal SteWhlSwtchUp_B_Stat(0xPressed) while displaying supplier EOL calibration chart, HUD shall ignore the command.

1.2.6.4.7.9 DIS-REQ-305197/A-Service calibration

Once the HUD receives the signal SteWhlSwtchUp_B_Stat(0xPressed) while displaying service calibration chart, HUD shall display the supplier EOL calibration chart

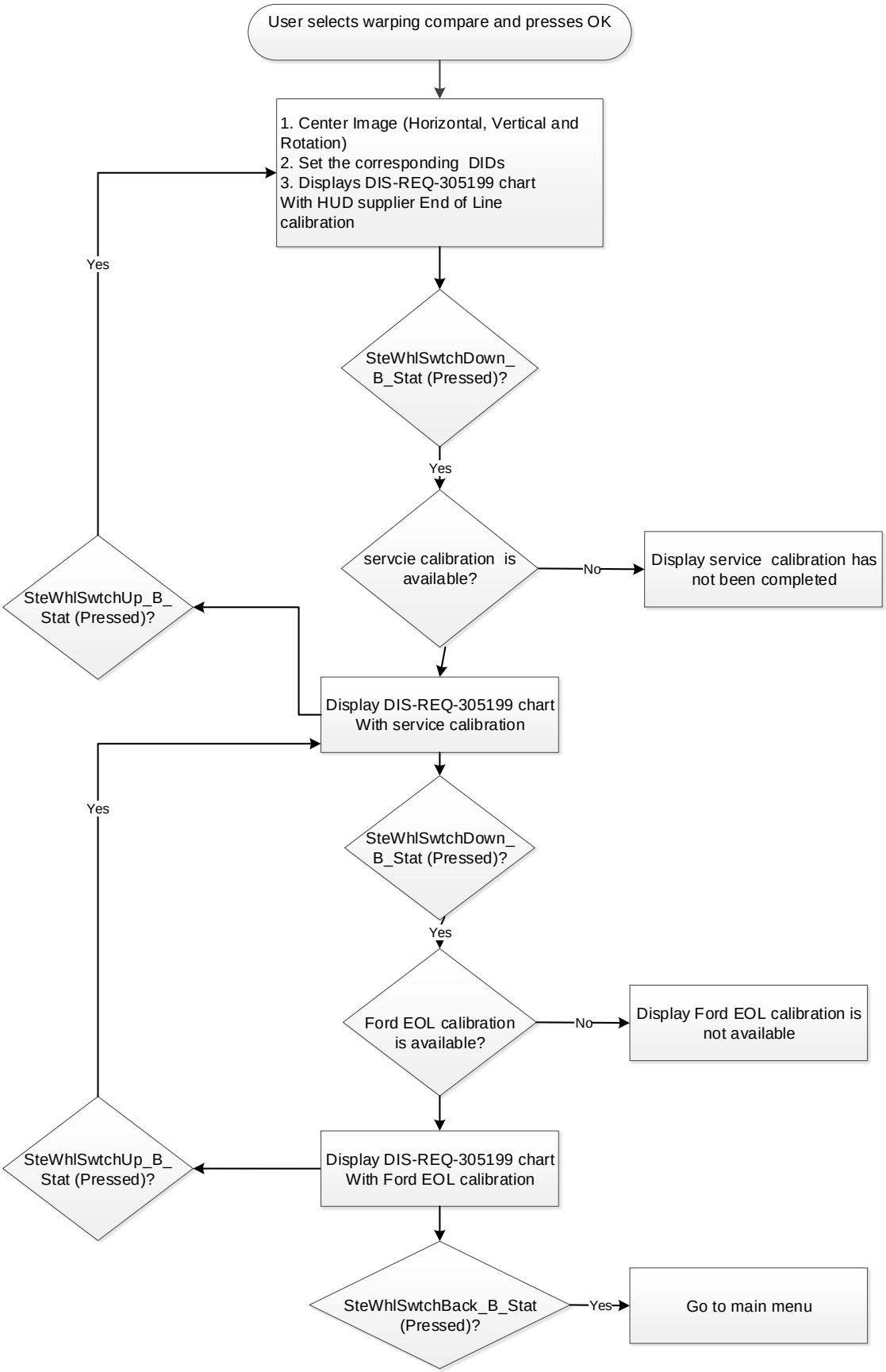
1.2.6.4.7.10 DIS-REQ-305198/A-Absence of service calibration prompt

Once the HUD receives the signal SteWhlSwtchUp_B_Stat(0xPressed) while displaying Ford EOL calibration chart, HUD shall display the service calibration chart if present or the absence of service calibration prompt (DIS-REQ-305198).

1.2.6.4.7.11 DIS-REQ-305658/A-Previous menu

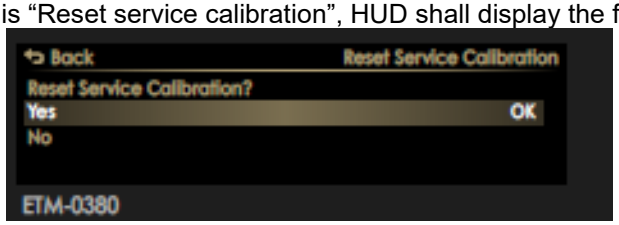
HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100msec. See DIS-REQ-305657:

1.2.6.4.7.11.1 DIS-REQ-305657/A-Warping Compare Logic Flow



1.2.6.4.8 DIS-REQ-305679/A-Reset Service Prompt

If the selected sub menu item is “Reset service calibration”, HUD shall display the following prompt, within 100msec



1.2.6.4.8.1 DIS-REQ-305659/A-Service calibration prompt

Once the user confirms resetting the service calibration prompt, HUD shall reset the service warping DIDs

1.2.6.4.8.2 DIS-REQ-305660/A-Selecting Yes or No

HUD shall not wrap around between selecting Yes or No (from the Rest Service Prompt, DIS-REQ-305679) using the up/down button Presses.

1.2.6.4.8.3 DIS-REQ-305661/A-Previous menu

HUD shall return to the previous menu upon the user response either “Yes” or “No”

1.2.6.4.8.4 DIS-REQ-305662/C-Module Diagnostic Main Menu

If the selected sub menu item is “Module Diagnostic Data”, HUD shall show the following data within 100msec:

Module Diagnostic Main Menu

A. Engineering data
B. Test chart names
C. DTCs
D. Power supply DIDs
E Power supply temp. DIDs
F. Other module DIDs

1.2.6.4.8.5 DIS-REQ-305663/A-Scroll up or down

The user shall have the ability to scroll up or down, DIS-REQ-305662 menu, as follows:

- Scroll up, within 100msec, upon the reception of SteWhlSwtchUp_B_Stat(0xPressed)
- Scroll down, within 100msec, upon the reception of SteWhlSwtchDown_B_Stat(0xPressed)

1.2.6.4.8.6 DIS-REQ-305664/B-Engineering Data

If the selected sub menu item is “Engineering Data”, HUD shall show the following data within 100msec:

DID No.	DID ID	DID Name	Value to Be Displayed
1	F110	SSDiagPart#	
2	F111	CoreAssemb#	
3	F113	DeliAssemb#	
4	F121	Software #3 Part#	
5	F124	ECUCal.Data #1	
6	F125	ECUCalData #2	
7	F15F	NOSGenTool Ver#	
8	F162	SWDnldSpecVer#	
9	F163	DiagSpecVer	
10	F166	NOSMsgDB#1Ver.#	
11	F188	ECUSW#	
12	F18C	HUDSerial #	

1.2.6.4.8.7 DIS-REQ-305665/A-Previous menu

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100 msec.

1.2.6.4.9 DIS-REQ-305678/A-Test Chart Sub Menu Selection

If the selected sub menu item is “Test Chart Names”, HUD shall display the following sub menu items, data within 100msec

A) 0x00 =Blob
B) 0x01=Boxed Blob
C) 0x02= Ghost
D) 0x03=White
E) 0x04=Black
F) 0x05=Red
G) 0x06=Green
H) 0x07=Blue
I) 0x08=Checker Board (3X3)
J) 0x09=Checker Board (4X4),
K) 0x0A= Grid with circles
L) 0x0B=FCW Light Bar
M) 0x0C=Grid
N) 0x0D=HUDImageCenterAdjustment Chart (HICA)
O) 0x0E= Sharpness: Diamond
P) 0x0F= Sharpness: MTF 1px
Q) 0x10= Sharpness: MTF 2px
R) 0x11=Sharpness: MTF 4px
S) 0x12=Sharpness: MTF 8px
T) 0x13=Sharpness: MTF 16px

1.2.6.4.9.1 DIS-REQ-305666/A-Scroll up or down

The user shall have the ability to scroll up or down, DIS-REQ-305678 sub menu, as follows:

- Scroll up, within 100msec, upon the reception of SteWhlSwtchUp_B_Stat(0xPressed)
- Scroll down, within 100msec, upon the reception of SteWhlSwtchDown_B_Stat(0xPressed)

1.2.6.4.9.2 DIS-REQ-305667/A-Test chart

The user shall have the ability to select any test chart by pressing Ok

1.2.6.4.9.3 DIS-REQ-305668/A-Previous menu

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100 msec

1.2.6.4.9.4 DIS-REQ-305669/A-DTC Data

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within100 msec

No.	Code	Local Snapshot	History	Current

1.2.6.4.9.5 DIS-REQ-305670/A-Previous menu

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100 msec

1.2.6.4.9.6 DIS-REQ-305671/B-Display Power Supply DIDs Data

If the selected sub menu item is “Display power Supply DIDs”, HUD shall show the following data within 100msec:

DID No.	DID ID	DID Name	Value to Be Displayed (V)
1	D111	HUDBattVOl	
2	FD01	PS1.2VLDO	
3	FD02	PS2.5VLDO	
4	FD03	PS5VLDO	
5	FD04	PS1.5VSMPS	
6	FD05	PS7VSMPS	
7	FD06	PS.DSMP3.3V	
8	FD15	PSDSMP1.8V	

1.2.6.4.9.7 DIS-REQ-305672/A-Previous menu

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100 msec

1.2.6.4.9.8 DIS-REQ-305673/B-Power Supply Temperature DIDs

If the selected sub menu item is “Display power supply temperature DIDs”, HUD shall show the following data within 100 msec.

DID No.	DID ID	DID Name	Value to Be Displayed (V)
1	FD1A	GreenLEDtemp	
2	FD1B	BlueLEDtemp	
3	FD1C	RedLEDtemp	

4	FD1D	DMDtemp	

1.2.6.4.9.9 DIS-REQ-305675/A-Previous menu

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100 msec.

1.2.6.4.9.10 DIS-REQ-305676/C-Other Module DIDs

If the selected sub menu item is “Display module DIDs (HUD DIDs without power supply and engineering data DIDs)”, HUD shall show the following data within 100msec:

DID No.	DID ID	DID Name	Value to Be Displayed (V)
1	0x6310	GearDisplay	
2	0xD100	ActvDiagSes	
3	0xD700	CritSWMon#1	
4	0xD701	CritSWMon#2	
5	0xDD00	GlobalRealTime	
6	0xDD80	VehSpeed	
7	0xFD00	FNOSCalib	
8	0xFD07	CM_Timer	
9	0xFD0C	AmbsenVal	Display as the final calculated ambient light sensor with the accuracy of three decimal places
10	0xFD0D	UsrBghtVal	
11	0xFD0E	HUDVert_Pos	
12	0xFD0F	HUDHozPos	
13	0xFD10	HUDRotPos	
14	0xFD11	AutoBghtVal	Display as a percent with the accuracy of three decimal places
15	0xFD12	MinCMTimr	
16	0xFD13	DayBgntVal	
17	0xFD14	NghtBgntVal	
18	0xFD22	BlueLEDFdbk	
19	0xFD23	GrenLEDFdbk	
20	0xFD24	RedLEDFdbk	
21	0xFD28	Rsetcount32	
22	0xFD29	AC_SYS_ID	
23	0xFD3A	PwrModeCont	
24	0xFD3B	GreenLEDCur	
25	0xFD3C	BlueLEDCur	
26	0xFD3D	RedLEDCur	
27	0xFD3E	DMDHeater	
28	0xFD40	SPIVresIC	
29	0xFD42	LCDDispType	
30	0xFD43	FCWDay	
31	0xFD4D	WarpModeEnb	
32	0xFD4E	FCWNightDim	
33	0xFD57	UsrBrtRange	
34	0xFD59	BrtTAUINCR	
35	0xFD5A	BrtTAUDECR	
36	0xFD5B	CUSTDIMMTAU	
37	0xFD5D	BrtRangeFCW	
38	0xFD5F	PIC_SYS_ID	

39	0xFD60	PNOR_SYS_ID	
40	0xFD61	NVM_SYS_ID	
41	0xFD62	SNOR_SYS_ID	
42	0xFD75	TrapezHorz	
43	0xFD76	TrapezVert	
44	0xFD77	CushHorz	
45	0xFD78	CushVert	
46	0xFD79	SmileVert	
47	0xFD7A	ShearHorz	
48	0xFD7B	ShearVertl	
49	0xFD7C	AsmSheHorzR	
50	0xFD7D	AsmSheHorzL	
51	0xFD7E	AsmCusHorzR	
52	0xFD7F	AsmCshHorzL	
53	0xFD81	iTransVert	
54	0xFD82	iRotation	
55	0xFD83	SmileHorizn	

1.2.6.4.9.11 DIS-REQ-305677/A-Previous menu

HUD shall return to the previous menu upon the reception of the CAN signal, SteWhlSwtchBack_B_Stat(0xPressed), within 100 msec.

1.3 Function/Performance

1.3.1 Operational Modes

1.3.1.1 F-REQ-305688/A-Remain active

HUD shall remain active as long as the CAN signal: Body_Info_HS3 -0x3B2(Ignition status (0x4-Run or 0x8-Start))

1.3.2 Voltage Levels

Refer to Cluster Features Table located in the Operational Modes and Voltage Range Strategies section in this SPSS.

1.3.3 System Accuracy

1.3.3.1 PFM-REQ-305722/A-Dynamically update

HUD shall dynamically update menu displays within a 100msec of a change

1.3.3.2 PFM-REQ-305723/A-Image calibration

HUD image calibration shall not allow the loosing of view of the image. The calibration software shall keep track of the image location at all times.

1.3.3.3 PFM-REQ-305725/A-Maximum virtual image

The maximum virtual image reduction of size shall not exceed 10% of the actual virtual image size.

1.3.3.4 PFM-REQ-305726/A-Size resolutions

HUD shall comply with Appendix D, Service Parameter Resolution table pixel and step size resolutions

1.4 Revision History

ETM STSS Revision History

Revision Level	Name	Change Description	Date
1.0	A. Mufid	Initial draft	10/27/2014
1.1	A. Mufid	Added eye box center adjustments	11/5/2014
1.3	A. Mufid	Added FCW Test Chart. Added minor edits	11/11/2014
1.4	A. Mufid	Added eye box Center and vertical DIDs	12/03/2014
1.5	A. Mufid	Break down Previous menu	12/8/2015
1.6	A. Mufid	Minor edits	12/11/2014
1.7	A. Mufid	Updated Figures 5 and 8	12/15/2014
1.8	A. Mufid	Added pressing the back button to all figures.	01/09/2015
1.9	A. Mufid	Added disclaimer menu	02/17/2015
1.9	A. Mufid	Minor edit updates.	02/17/2015
1.9	A. Mufid	Added Appendix C	02/17/2015
1.10	A. Mufid	Shortened DIDs Names	03/12/2015
1.11	A. Mufid	Added FD42 and FD43	4/1/2015
1.12	A. Mufid	Split requirement 1.2.4.3 into requirements 1.2.4.3 and 1.2.4.4	9/25/2015
1.12	A. Mufid	Deleted requirement number 1.2.5.2	9/25/2015
1.12	A. Mufid	Deleted requirement number 1.2.5.2	9/25/2015
1.12	A. Mufid	Added the submenu item: warping compare to Figure 3	9/25/2015
1.12	A. Mufid	Added the details for warping compare into requirements 1.2.5.3.15 through 1.2.5.3.15.4	9/25/2015
1.12	A. Mufid	Added the requirement “press and hold in 1.2.5.3.4 Added the requirement 1.2.5.3.5	9/25/2015
1.12	A. Mufid	Updated Figure 7. Only FD25 requires update	9/25/2015
1.12	A. Mufid	Added the requirement “press and hold in 1.2.5.3.9 Added the requirement 1.2.5.3.10	9/25/2015
1.12	A. Mufid	Updated Figures 15 and 19	9/25/2015
1.13	A. Mufid	Rewrote section 1.2.5.3.14.10	10/06/2015
1.13	A. Mufid	Used FD83 for Horizontal smile distortion	10/07/2015
1.14	A. Mufid	Global search for safe and replaced with save	10/8/2015
1.14	A. Mufid	Added “and return to previous menu” in 1.2.5.4.15.8	10/8/2015
1.14	A. Mufid	Added “and return to previous menu” in 1.2.5.4.16.8	10/8/2015
1.14	A. Mufid	Replaced main with previous menu 1.2.5.4.16.9	10/8/2015
1.14	A. Mufid	Replaced Figure 21 with the correct figure	10/8/2015
1.14	A. Mufid	Updated 1.2.5.5.2.2 requirement	10/8/2015
1.15	A. Mufid	Replaced FD25 with FD80	10/13/2015
1.15	A. Mufid	Deleted FD80 from Table 4	10/13/2015
1.15	A. Mufid	Deleted FD25 from Figure 14	10/13/2015
1.15	A. Mufid	Deleted FD81 from Table 5	10/13/2015
1.16	A. Mufid	Added requirement number 1.2.4.2	10/15/2015
1.16	A. Mufid	Added requirement number 1.2.5.4.2	10/15/2015
1.16	A. Mufid	Updated section 1.2.5.4.18	10/15/2015
1.16	A. Mufid	Updated section 1.2.5.4.19	10/15/2015
1.16	A. Mufid	Updated section 1.2.5.4.20	10/15/2015
1.16	A. Mufid	Updated section 1.3.3	10/15/2015
1.16	A. Mufid	Added Appendix D	10/15/2015

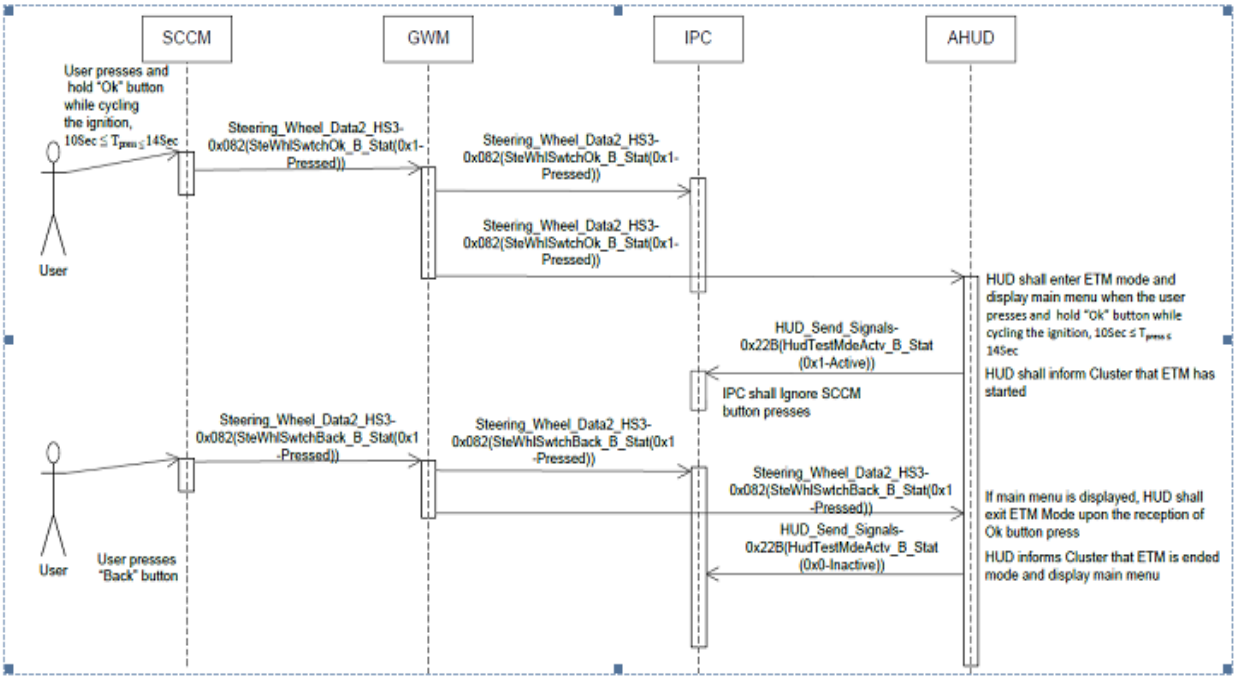
1.17	A. Mufid	Replaced both figures 5 and 8 with 3X3 Andreas charts	10/22/2015
1.17	A. Mufid	Updated both requirements: 1.2.5.4.3.1 and 1.2.5.4.3.2	10/22/2015
1.17	A. Mufid	Updated both requirements: 1.2.5.4.4.1 and 1.2.5.4.4.2	10/22/2015
1.17	A. Mufid	Updated section 1.2.5.4.4.1	10/22/2015
1.17	A. Mufid	Updated section 1.2.5.4.9	10/22/2015
1.17	A. Mufid	Updated Figure 28	10/22/2015
1.17	A. Mufid	Updated Table 6	10/22/2015
1.17	A. Mufid	Updated Table 8	10/22/2015
1.17	A. Mufid	Updated Table 9	10/22/2015
1.17	A. Mufid	Updated Table 10	10/22/2015
1.17	A. Mufid	Deleted Appendix B	10/22/2015
1.18	A. Mufid	Updated Appendix C	11/11/2015
1.18	A. Mufid	Updated Figure 28	11/11/2015
1.18	A. Mufid	Updated Table 9	11/11/2015
1.18	A.Mufid	Updated Table 10	11/11/2015
1.19	A.Mufid	Updated section 1.2.4.1	11/11/2015
1.20	A.Mufid	Updated section 1.2.4.1	12/18/2015
1.21	A.Mufid	Updated section 1.2.4.1	12/23/2015
1.21	A.Mufid	Updated tables8, 9 and 10. Shorten DID names	12/23/2015
1.22	A.Mufid	Updated section 1.2.4.1	1/11/2016
1.123	A.Mufid	Update section 1.2.4 Title	3/29/2016
1.123	A.Mufid	Added requirement 1.2.4.1	3/29/2016
1.123	A.Mufid	Updated requirement 1.2.4.2	3/29/2016
1.123	A.Mufid	Added section 1.2.5 title	3/29/2016
1.123	A.Mufid	Deleted DD82 and FD1F from Table 9	3/29/2016
1.123	A.Mufid	Updated the name of FD43 in Table 10. Updated the display requirement for FD11, FD21 and FD0C	3/29/2016
1.124	A.Mufid	Updated Figure 10	4/15/2016
1.125	A. Mufid	Updated Table 10. Deleted FD0A	4/27/2016
1.125	A. Mufid	Updated Table 10. Deleted FD27	4/27/2016
1.125	A. Mufid	Updated Table 10. Deleted FD41	4/27/2016
1.125	A. Mufid	Updated Table 10. Deleted FD58	4/27/2016
1.125	A. Mufid	Updated Table 10. Deleted FD5C	4/27/2016
1.126	A. Mufid	Updated Table 6. Deleted F109	4/28/2016
1.126	A. Mufid	Updated Table 6. Deleted F17C	4/28/2016
1.126	A. Mufid	Updated Table 6. Deleted F180	4/28/2016
1.127	A. Mufid	Deleted FD84 from Table 10	7/19/2016
1.127	A. Mufid	Deleted FD21 from Table 10	7/19/2016
1.127	A. Mufid	Deleted FD64 from Table 10	7/19/2016
1.128	A.Mufid	Global replacement of Simon Chart with Andreas Chart	8/16/2016
1.128	A.Mufid	Updated Figures 5, 6, 7, 8, 9, 10 and 28	8/16/2016
1.128	A.Mufid	Updated requirement of section 1.2.6.4.3.1	8/16/2016
1.128	A.Mufid	Updated requirement of section 1.2.6.4.3.2	8/16/2016
1.129	A.Mufid	Global replacement of Andreas Chart with HUDImageCenterAdjustment (HICA) Chart	8/30/2016
1.130	A.Mufid	Removed Center Horizontal Adjustment menu from Figure 3	11/3/2016
1.130	A.Mufid	Removed section 1.2.6.4.3 (Center Horizontal Adjustment)	11/3/2016
1.131	A. Mufid	Deleted the following DIDs from Table 10: FD80 FD44 FD45 FD46 FD47 FD48 FD49	11/15/2016

		FD4A FD4B FD4C	
V1.132	A. Mufid	Deleted the following DIDs from Table 10: FD3F FD63	11/16/2016
1.133	A. Salameh	Updated section 1.2.4 and Figure 4 to consider the Vision Steering Wheel	8/4/2017
1.134	P.Denduku	Initial VSEM RM Release	04/04/2018
1.135	Ilopezla	"Added DID information in REQ-305662" A.Salameh updated this STSS offline with this change on 5/7/2018 VSEM REQ was not updated.	2/4/2019
1.136	Ilopezla	Removed note from REQ-305662 Removed DIDs F120, FD3E, FD65-FD74, FD04. FD16. FD5E, FD0B, FD20 A.Salameh made these updates offline on 5/18/2018. VSEM REQ was not updated at the time.	2/4/2019
1.137	Ilopezla	Removed DID ID 0x0202- per Netcom this DID is no longer required (not required to be implemented per GGDS perspective) A.Salameh made these updates offline on 7/23/2018. VSEM REQ was not updated at the time.	2/4/2019

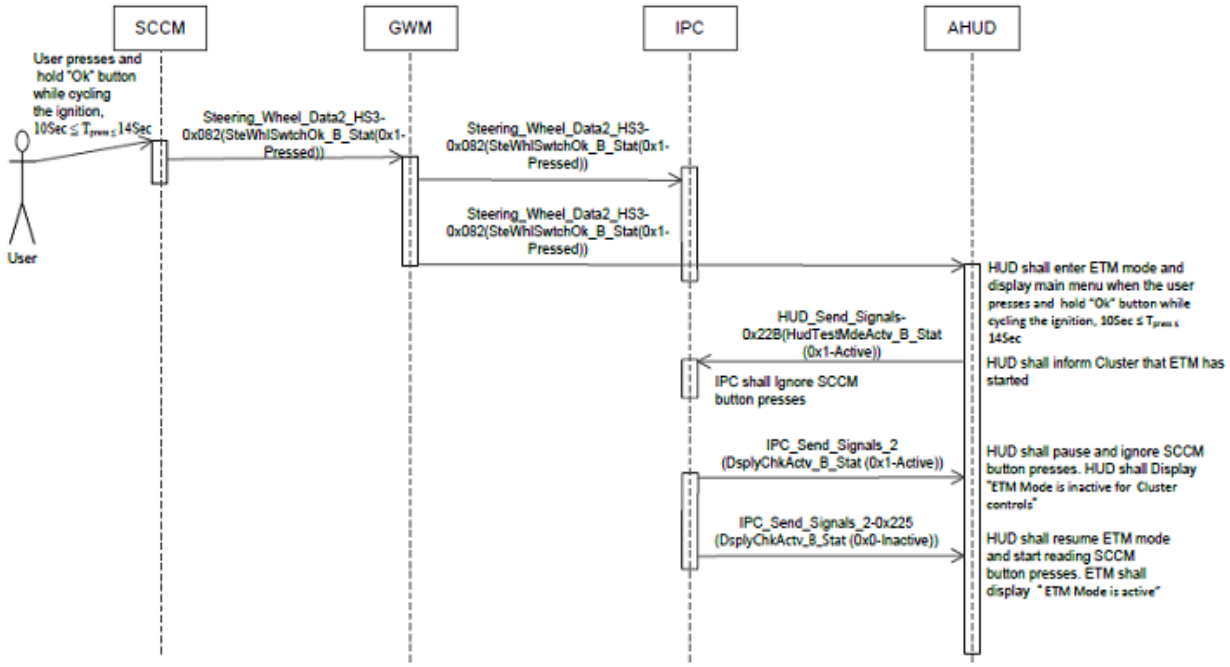
1.5 Appendix

1.5.1 Appendix A

HUD ETM Entry/Exit Requirements

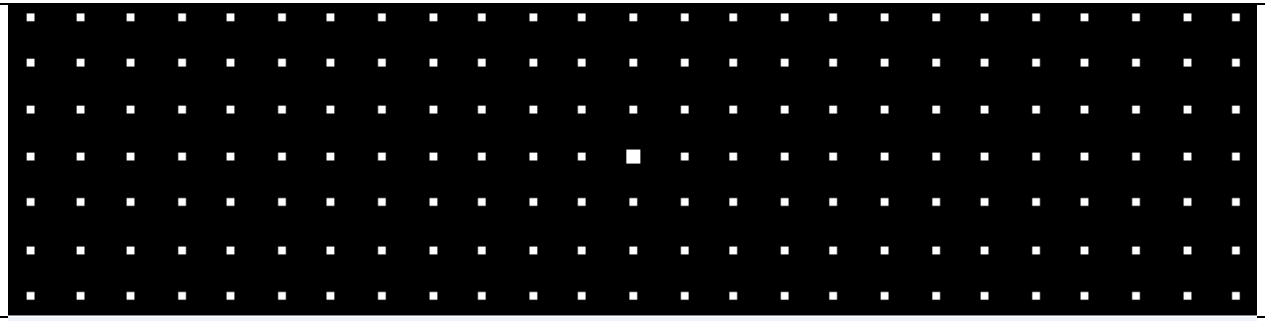
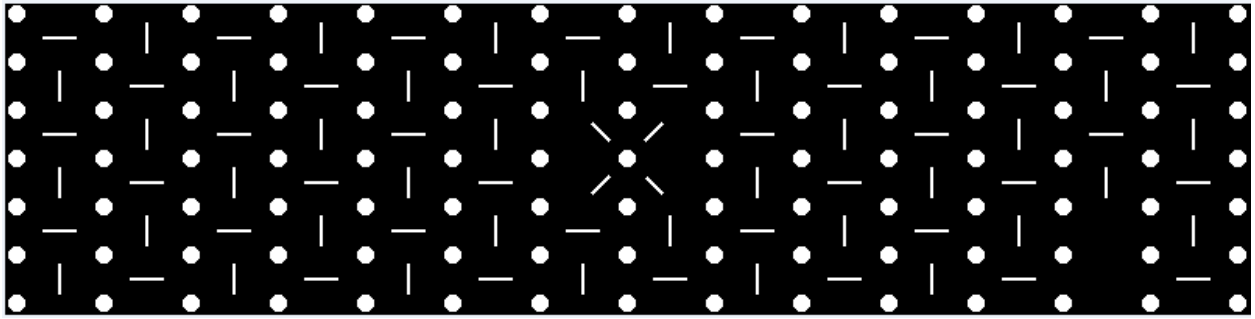
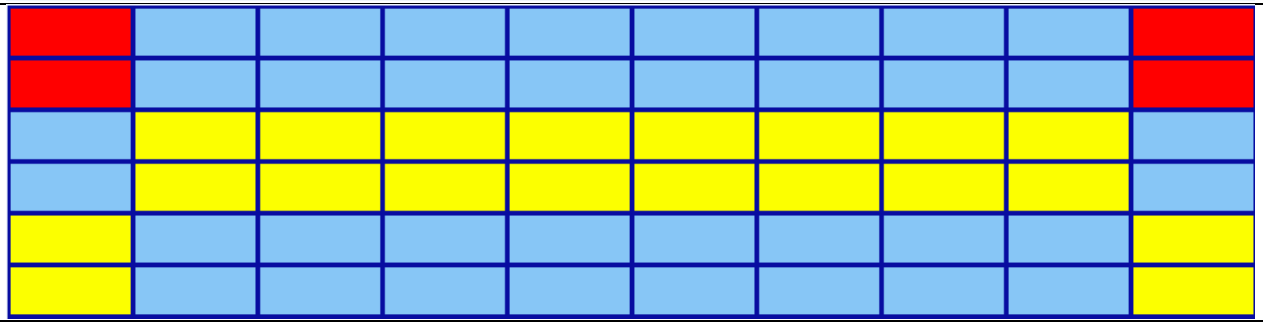


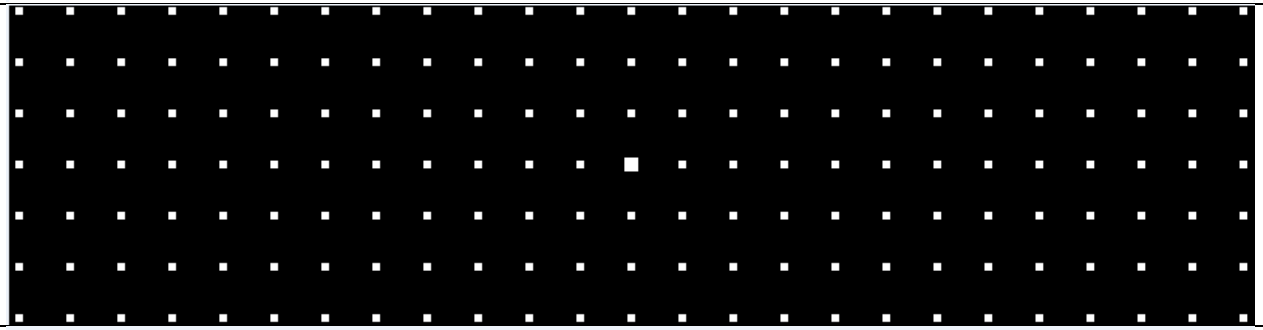
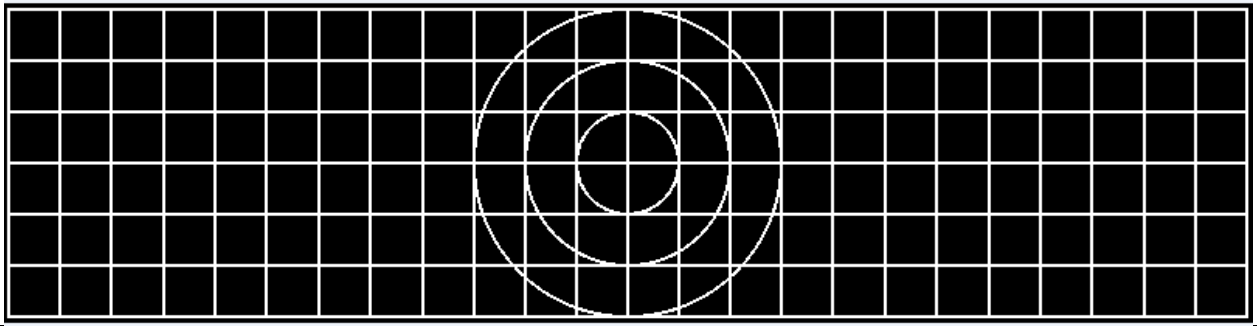
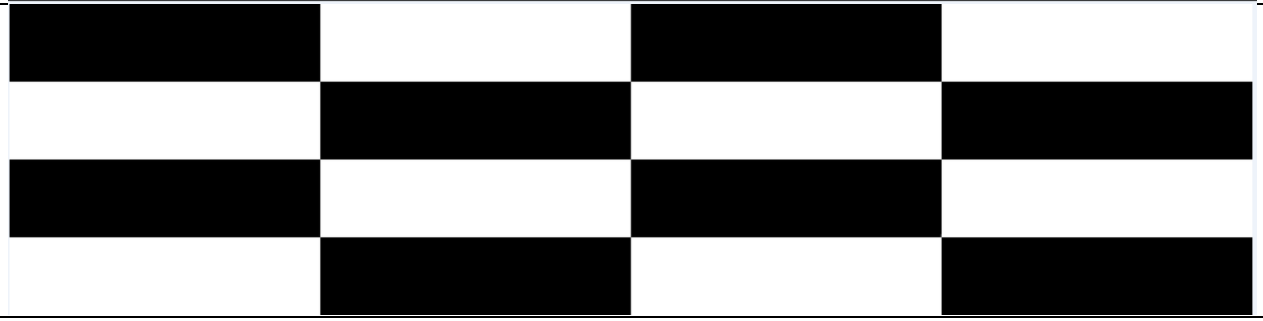
HUD ETM Mode Cease/Resume Requirements

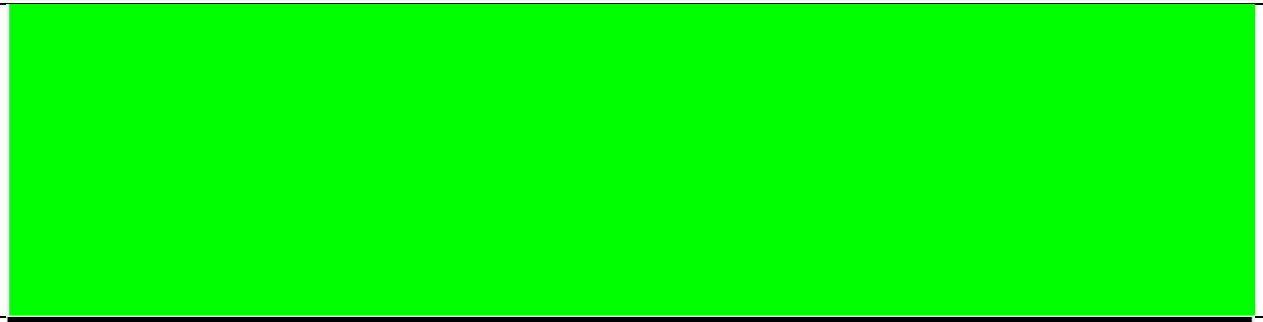
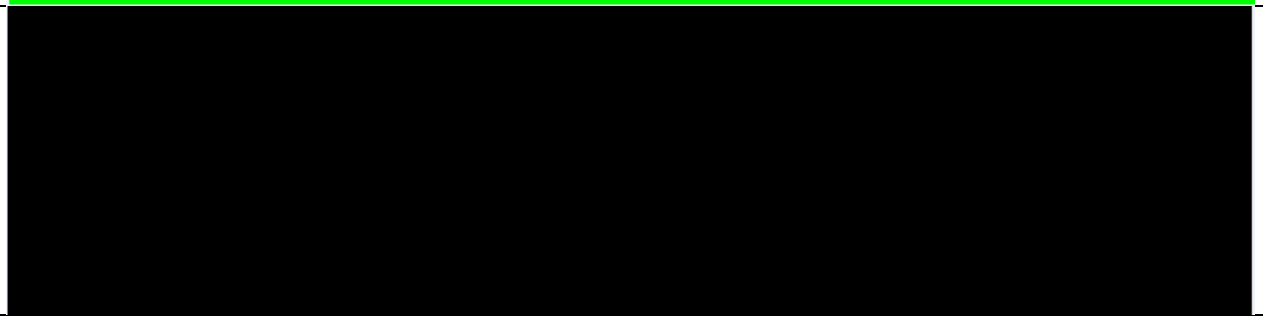


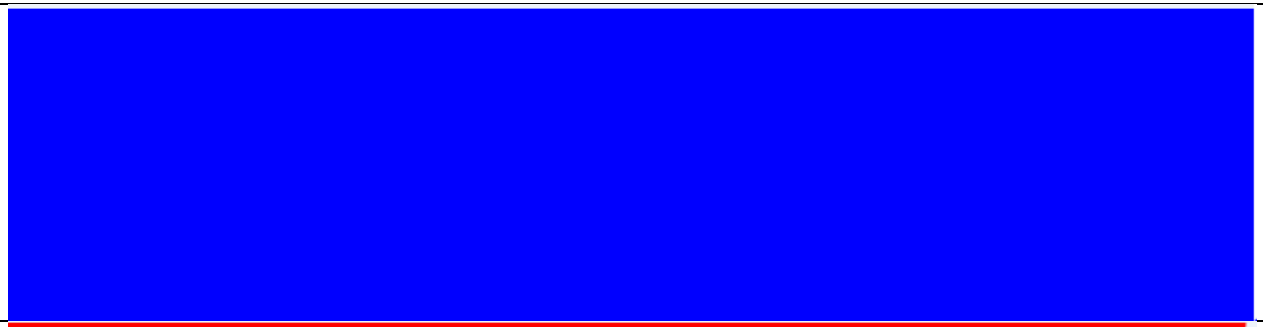
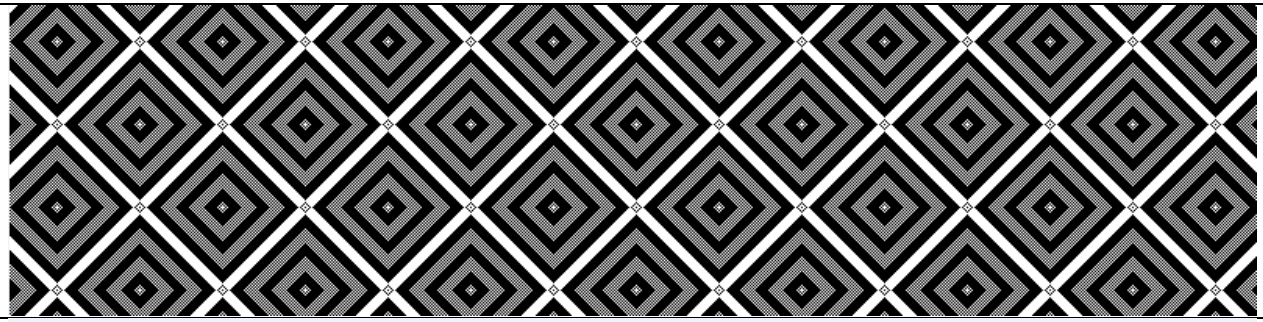
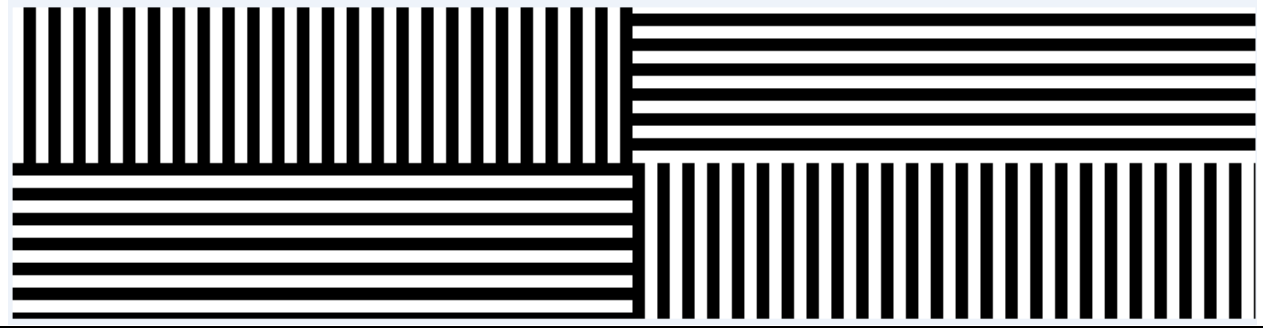
1.5.2 Appendix C

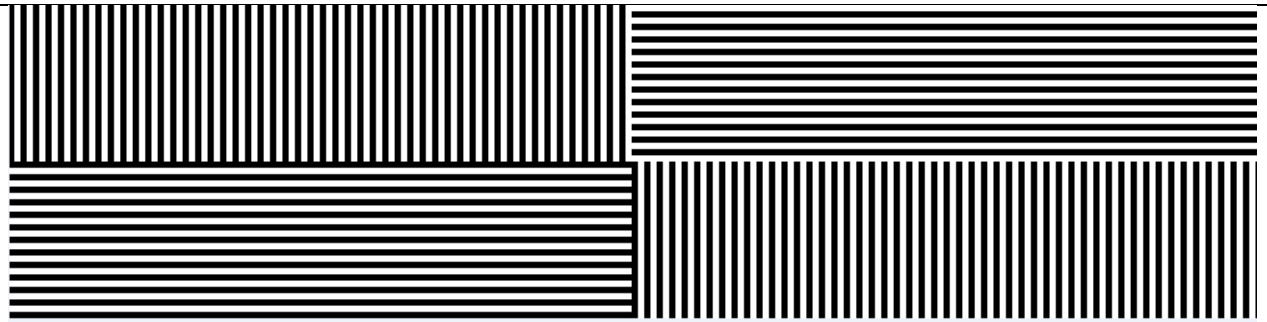
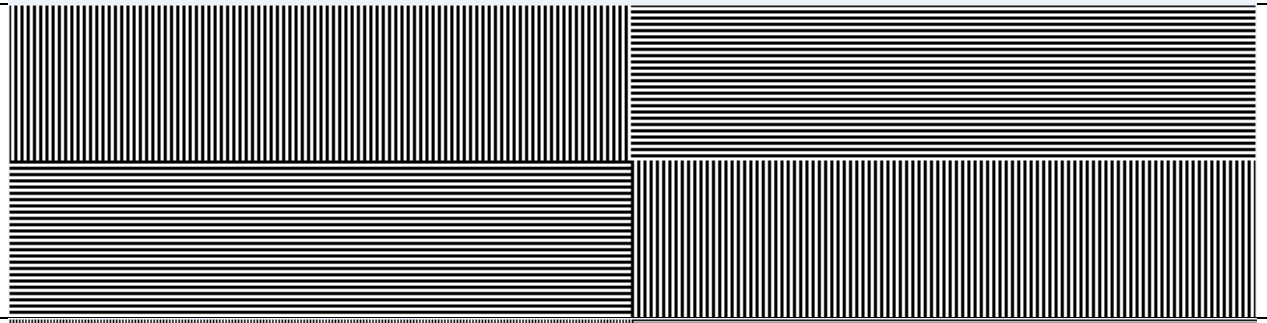
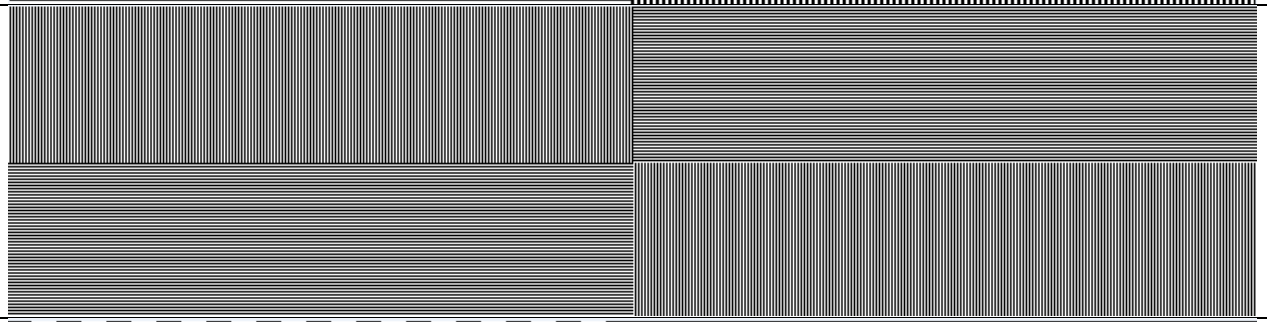
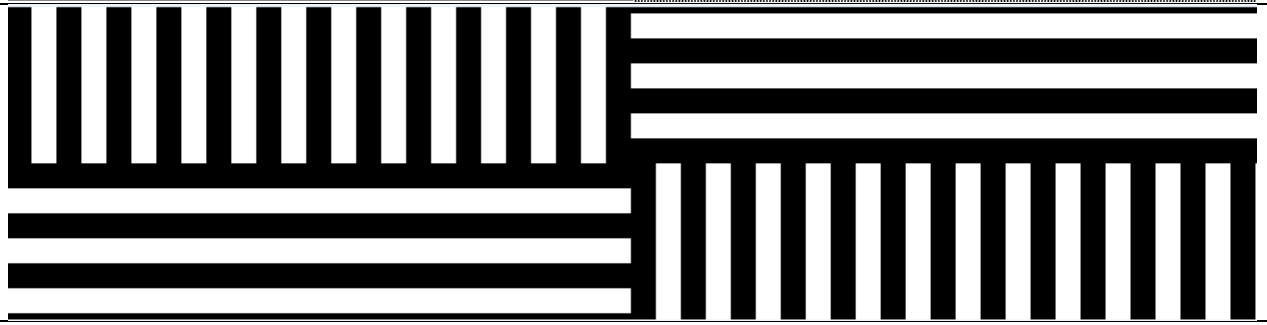
HUD Chart Types

Chart Name	Charts (800X200 Pixels)
Boxed Blob	
Ghost	
HUDImageCenter Adjustment (HICA) Chart	

White test Chart	
Blob	
Grid With Circles	
4X4 Checker Board	

3X3 Checker Board	
Red Pattern	
Green Pattern	
Black Pattern	

Blue Pattern	
FCW	
Charts (854X480 Pixels)	
Sharpness: Diamond	
Sharpness: MTF 1px	

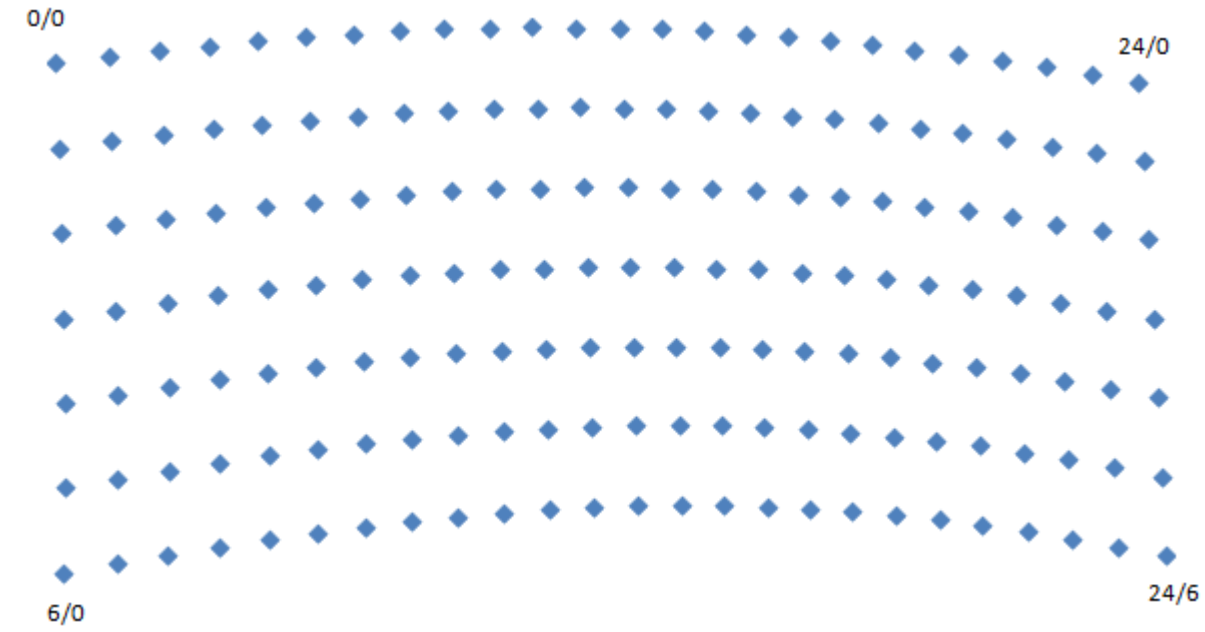
Sharpness: MTF 2px	
Sharpness: MTF 4px	
Sharpness: MTF 8px	
Sharpness: MTF 16px	

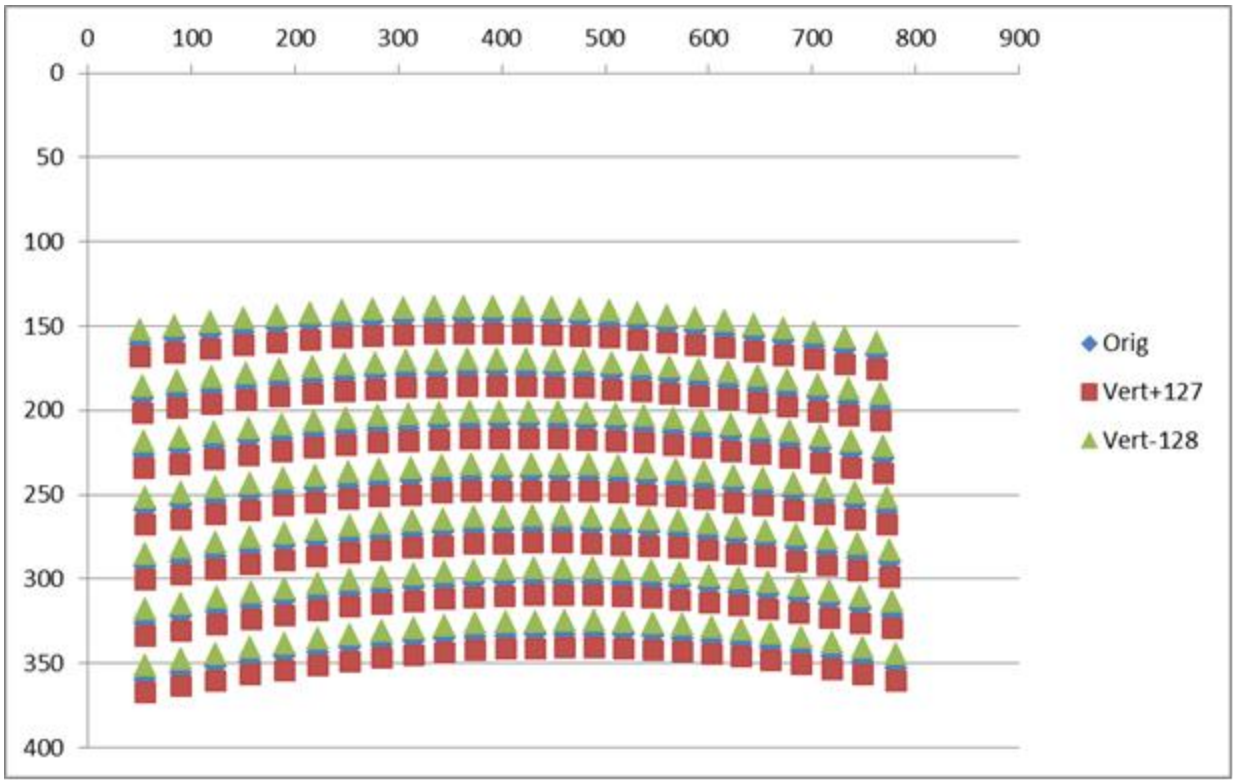
1.5.3 Appendix D

Service Parameter Resolution

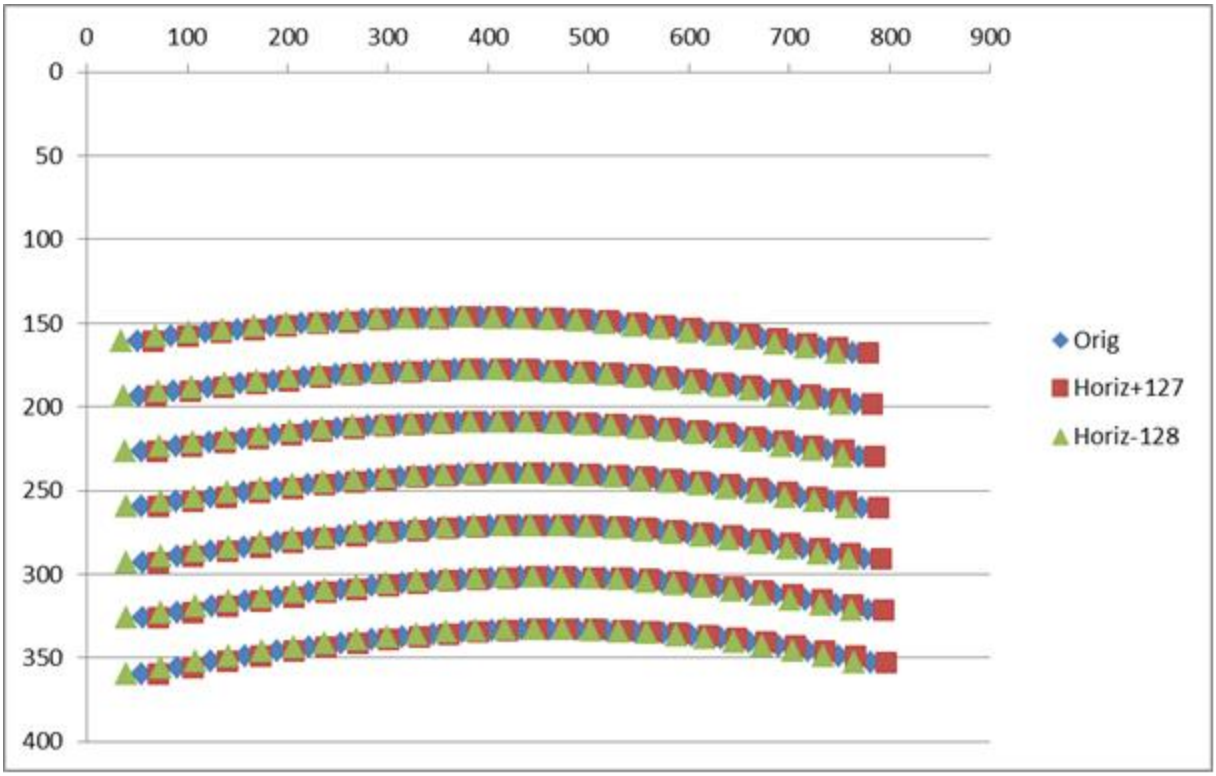
Service Parameter Resolution

Service Parameter Adjustment	Pixel Resolution [pix/step]	Max Pixel Movement	+/- direction indication (i.e., if positive, what is the direction/type of change.)	Reference warping matrix point x/y (Coordinate (if possible) of pixel that max pixel movement could be observed.)	Up/Down Key Steps per Key press. (Configured in HMI.)
Vertical	0.0625	+7.9375 -8	See picture below	0/0	1
Horizontal	0.125	+15.875 -16	See picture below	0/0	1
Rotation	0.7955	+101.0349 -101.8276	See picture below	24/0	1
Horizontal Trapezium	0.0625	+7.9375 -8	See picture below	0/0 or 0/6	1
Horizontal Cushion	0.1875	+23.8125 -24	See picture below	0/3 or 24/3	1
Horizontal Smile	0.125	+15.875 -16	See picture below	0/3 or 24/3	1
Horizontal Shear	0.1071	+13.7088 -13.6017	See picture below	0/0 or 0/6	1
Asym Shear Horizontal Right	0.1071	+13.7088 -13.6017	See picture below	24/0 or 24/6	1
Asym Shear Horizontal Left	0.1071	+13.7088 -13.6017	See picture below	0/0 or 0/6	1
Asym Cushion Horizontal Right	0.1875	+23.8125 -24	See picture below	24/3	1
Asym Cushion Horizontal Left	0.1875	+23.8125 -24	See picture below	0/3	1
Vertical Trapezium	0.25	+32 -31.75	See picture below	0/0 or 24/6	1
Vertical Cushion	0.0468	+5.9436 -6	See picture below	12/0 or 12/6	1
Vertical Smile	0.125	+16 -15.875	See picture below	12/0 or 12/6	1
Vertical Shear	0.06	+7.68 -7.62	See picture below	0/0 or 24/0	1

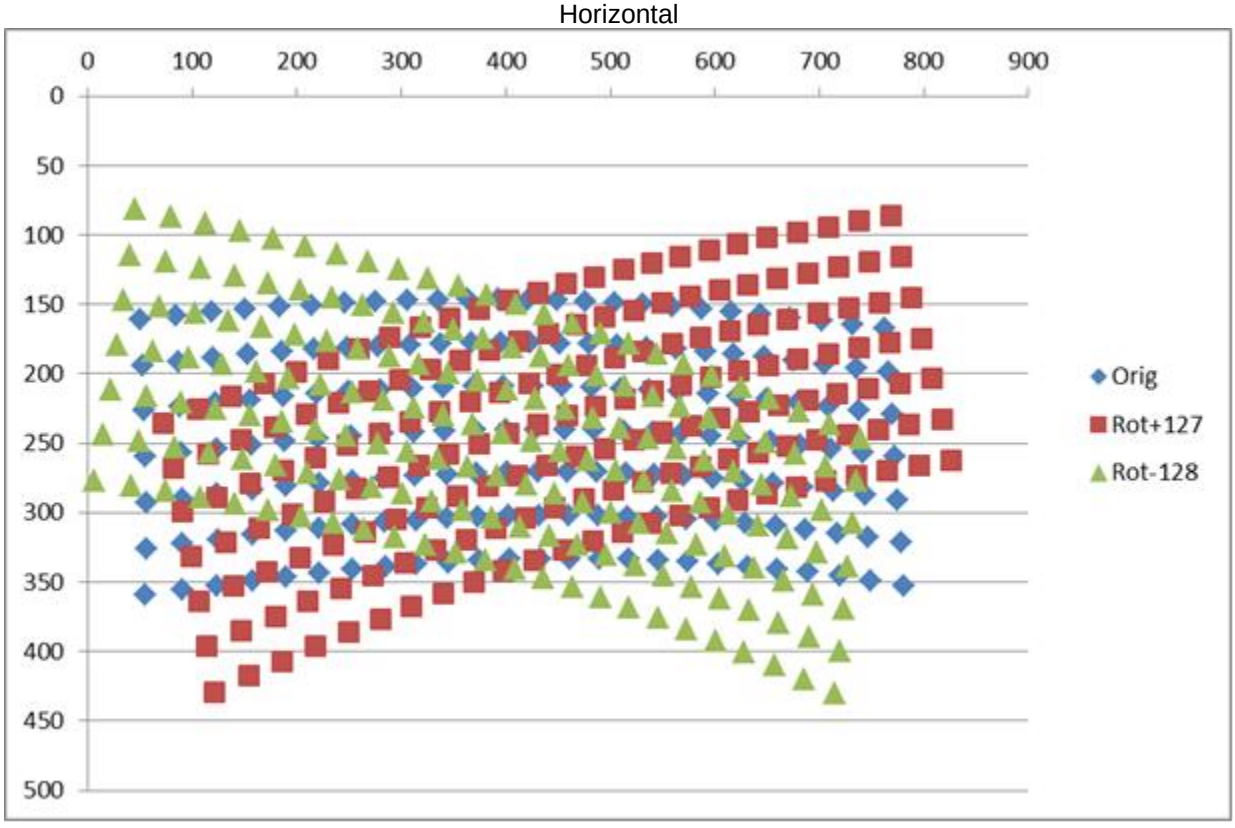

0/0
24/0
6/0
24/6


0
100
200
300
400
500
600
700
800
900
0
50
100
150
200
250
300
350
400
Orig
Vert+127
Vert-128

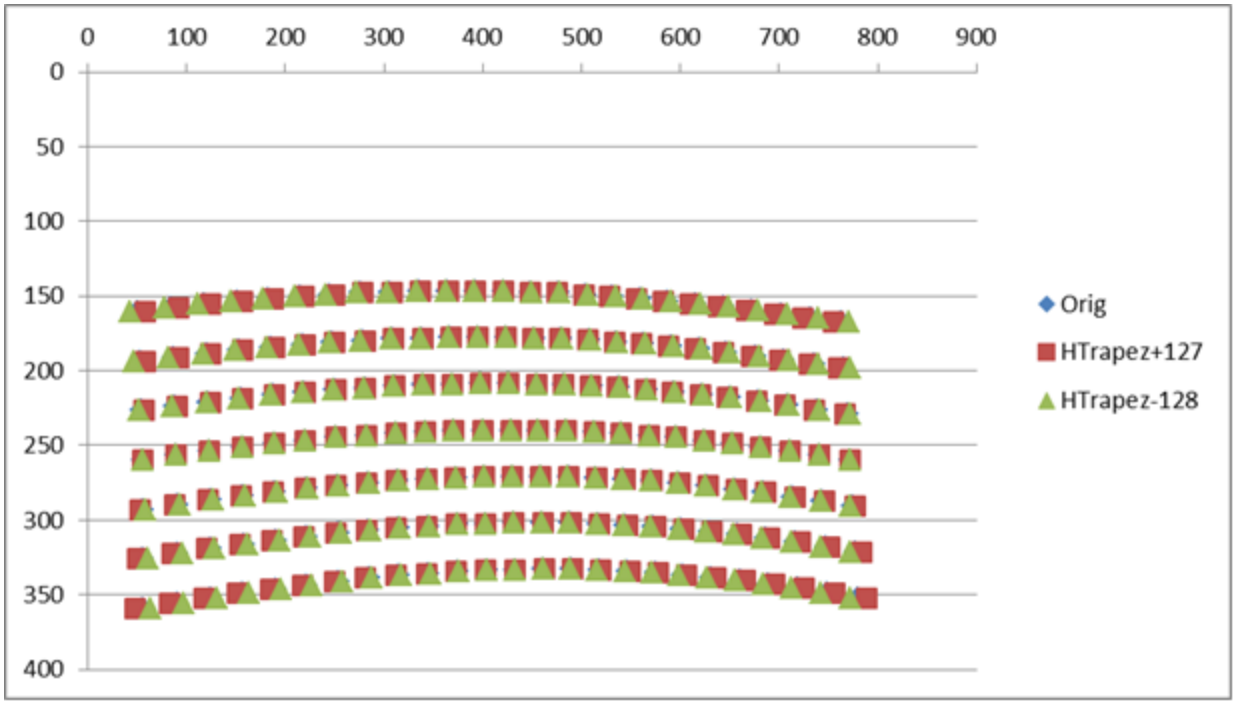
Vertical



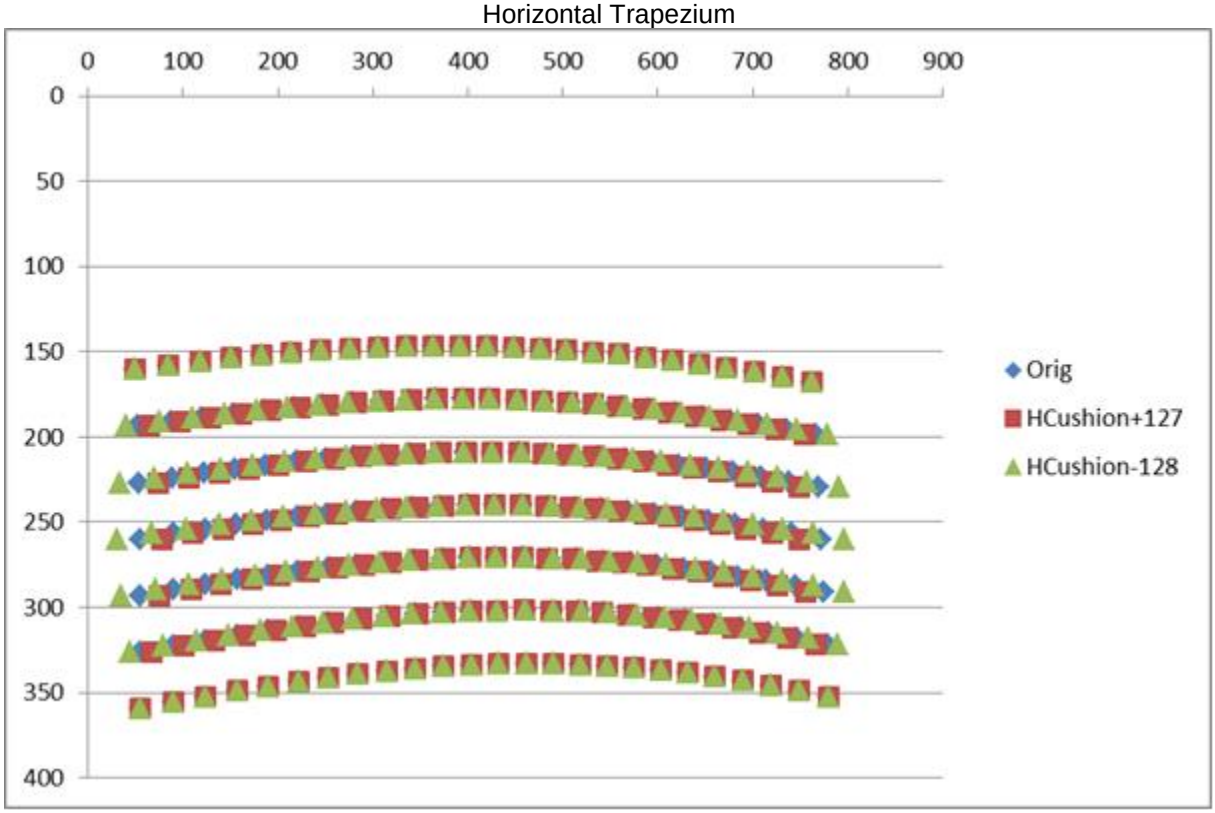
Horizontal



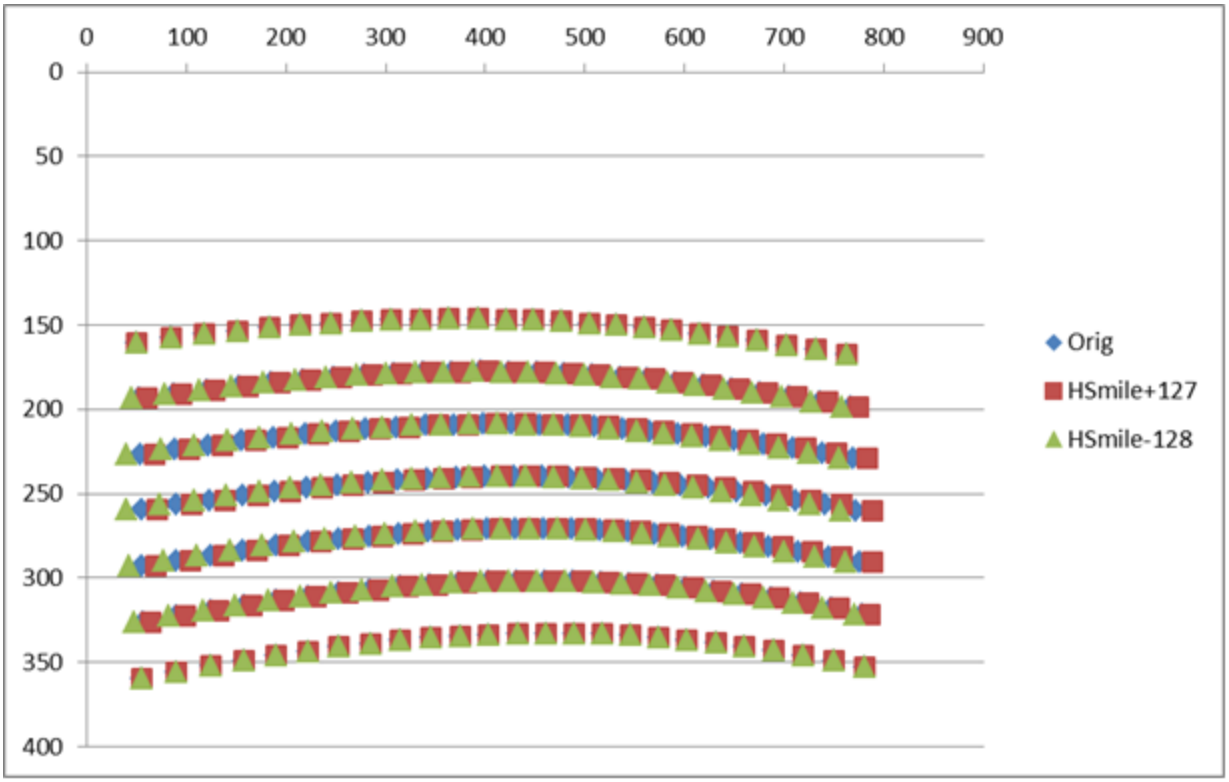
Rotation



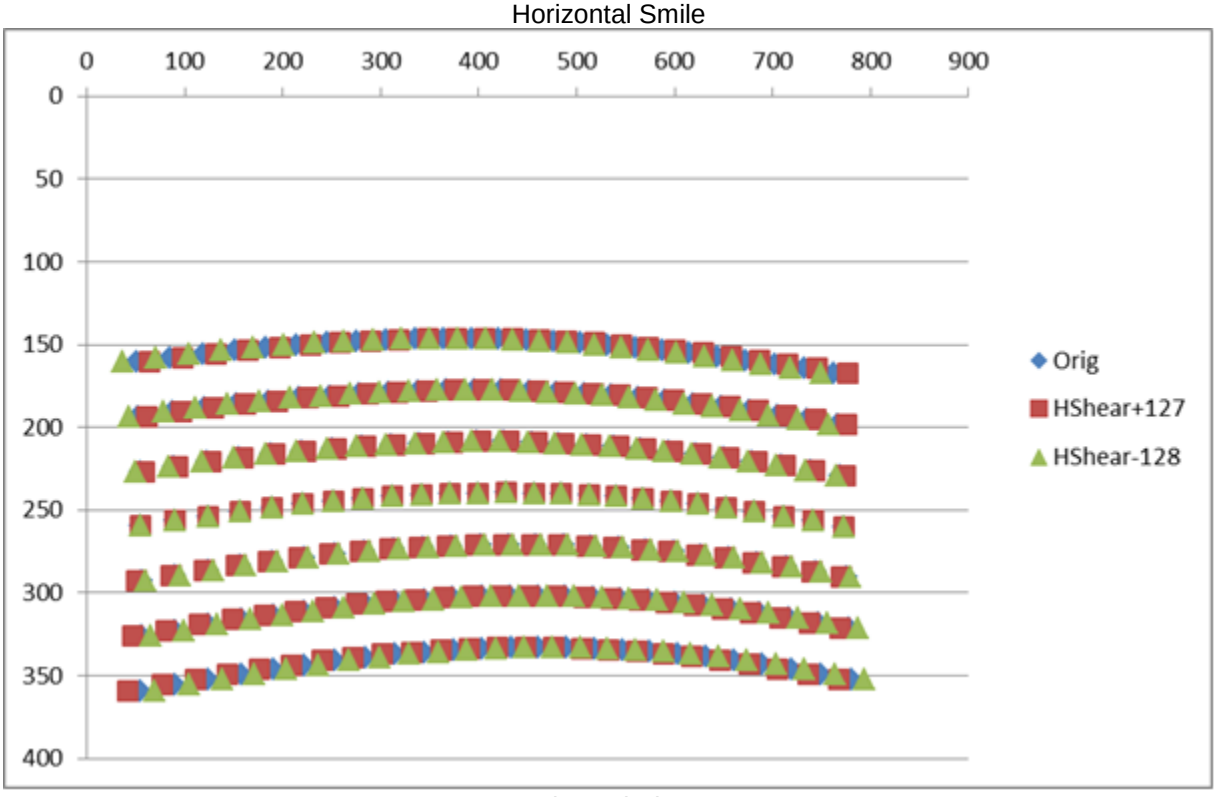
Horizontal Trapezium



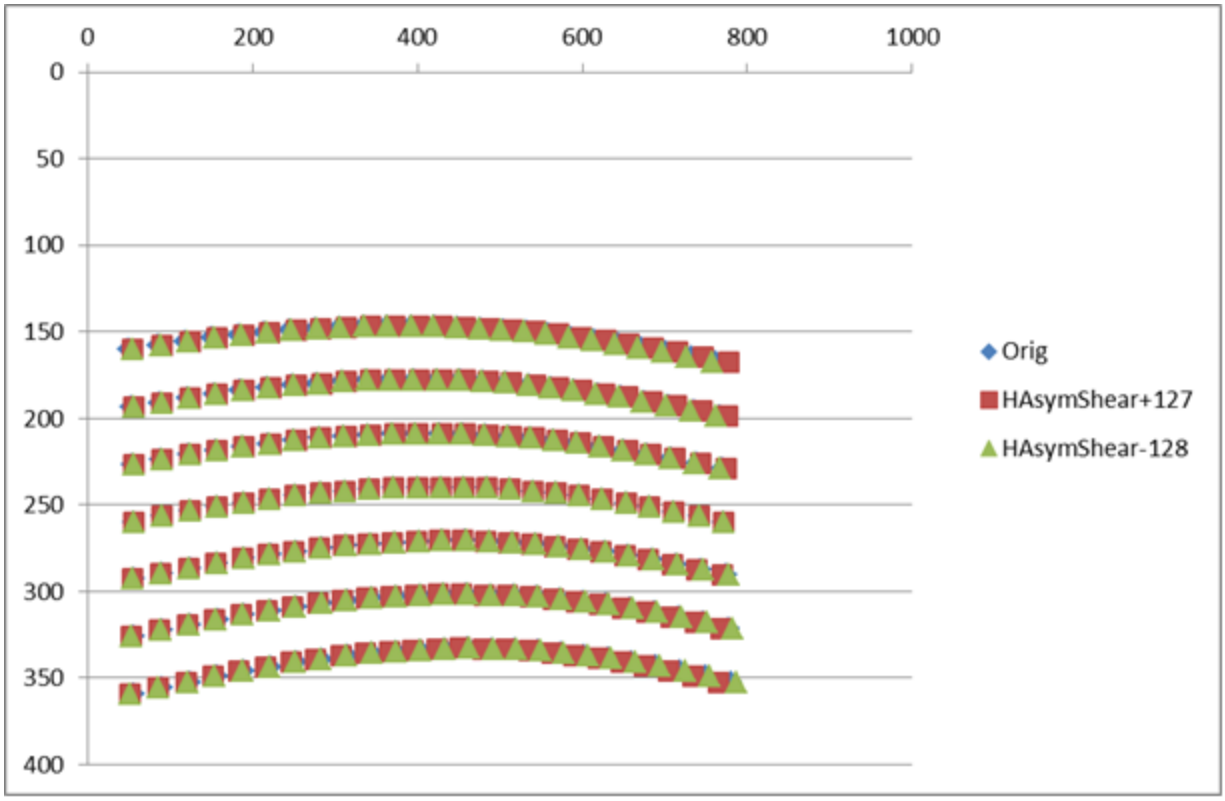
Horizontal Cushion



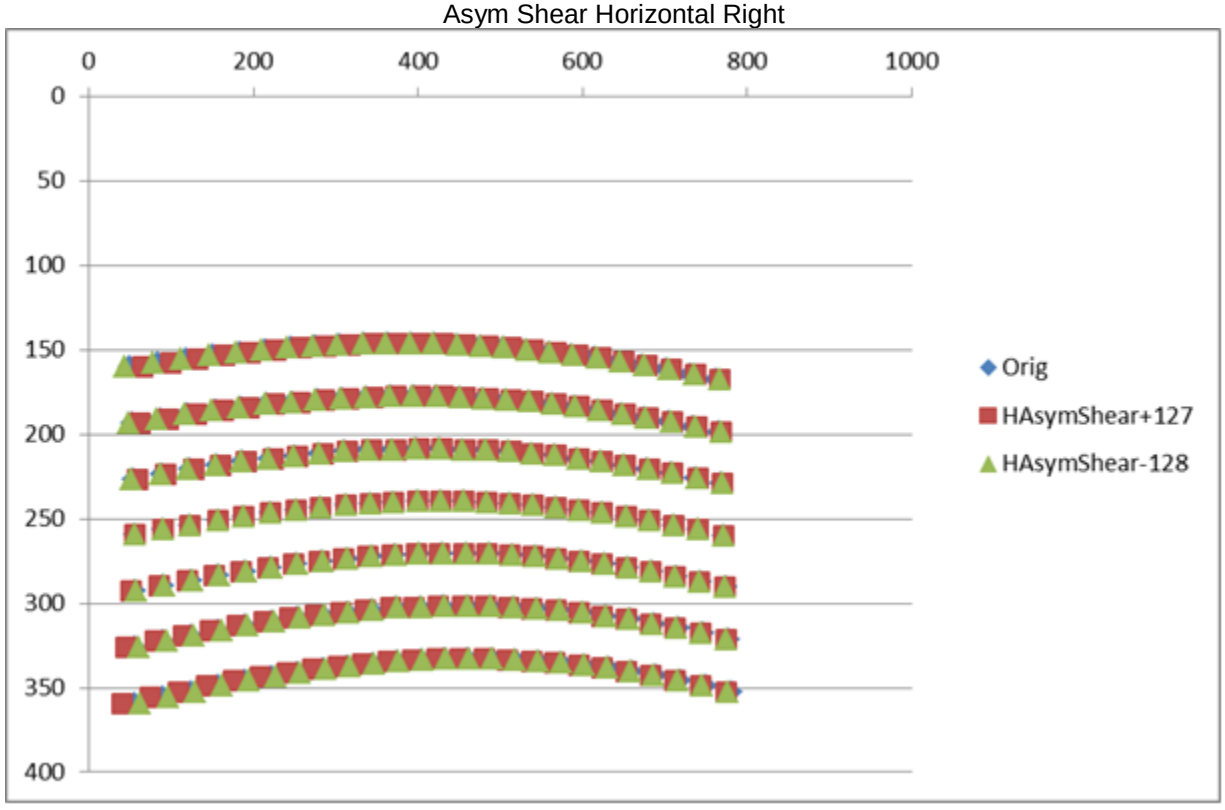
Horizontal Smile



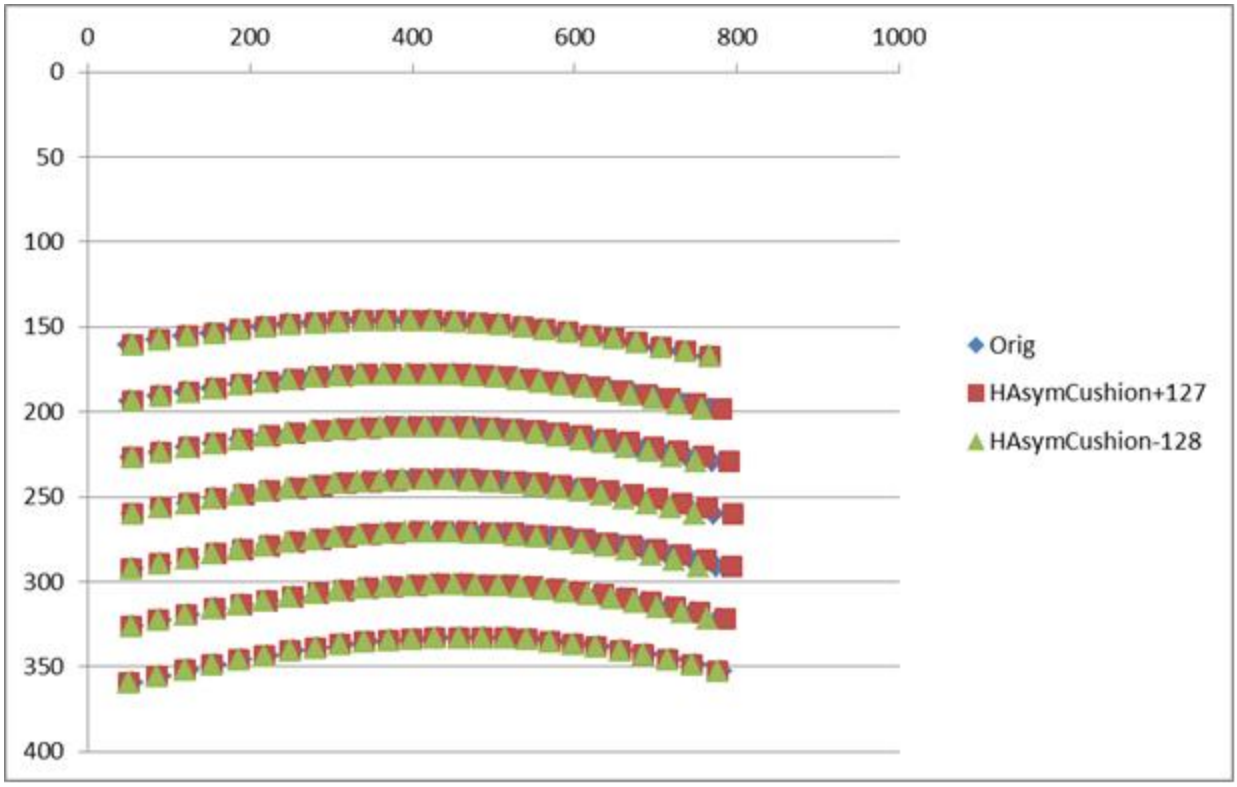
Horizontal Shear



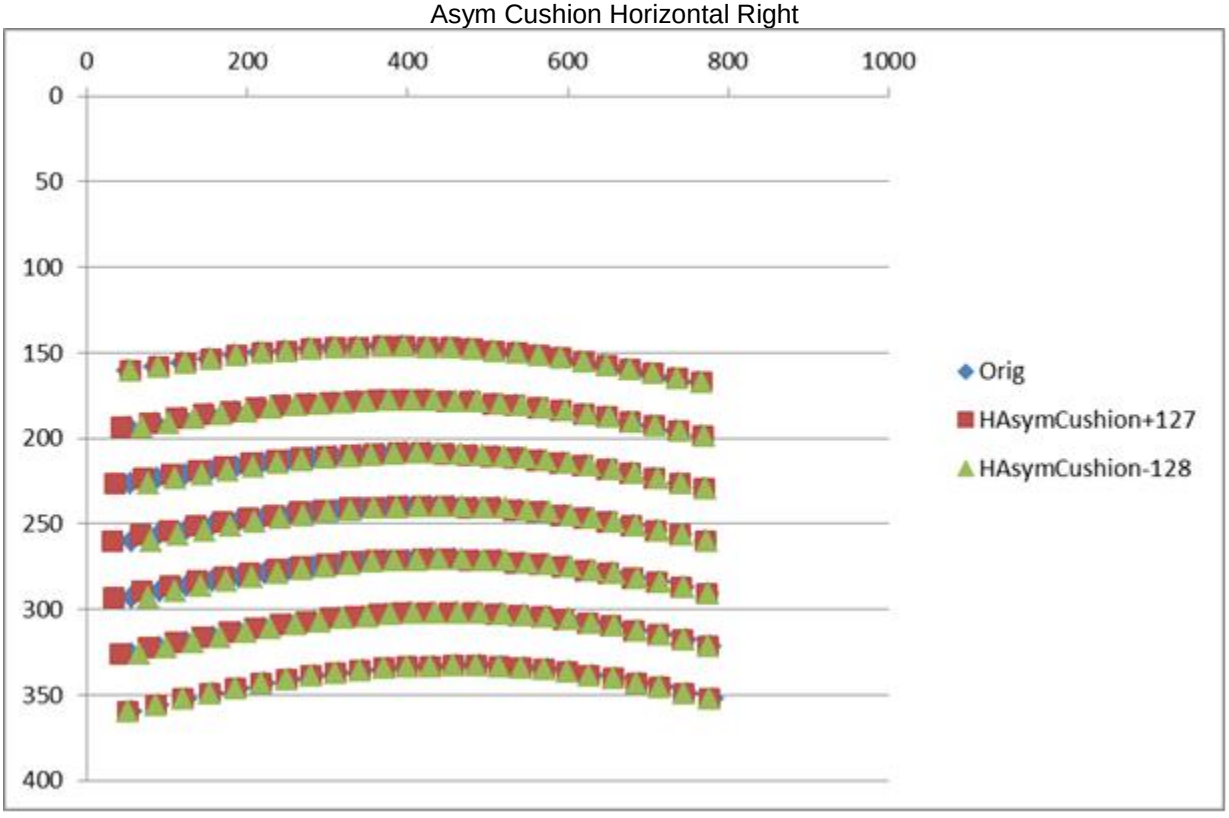
Asym Shear Horizontal Right



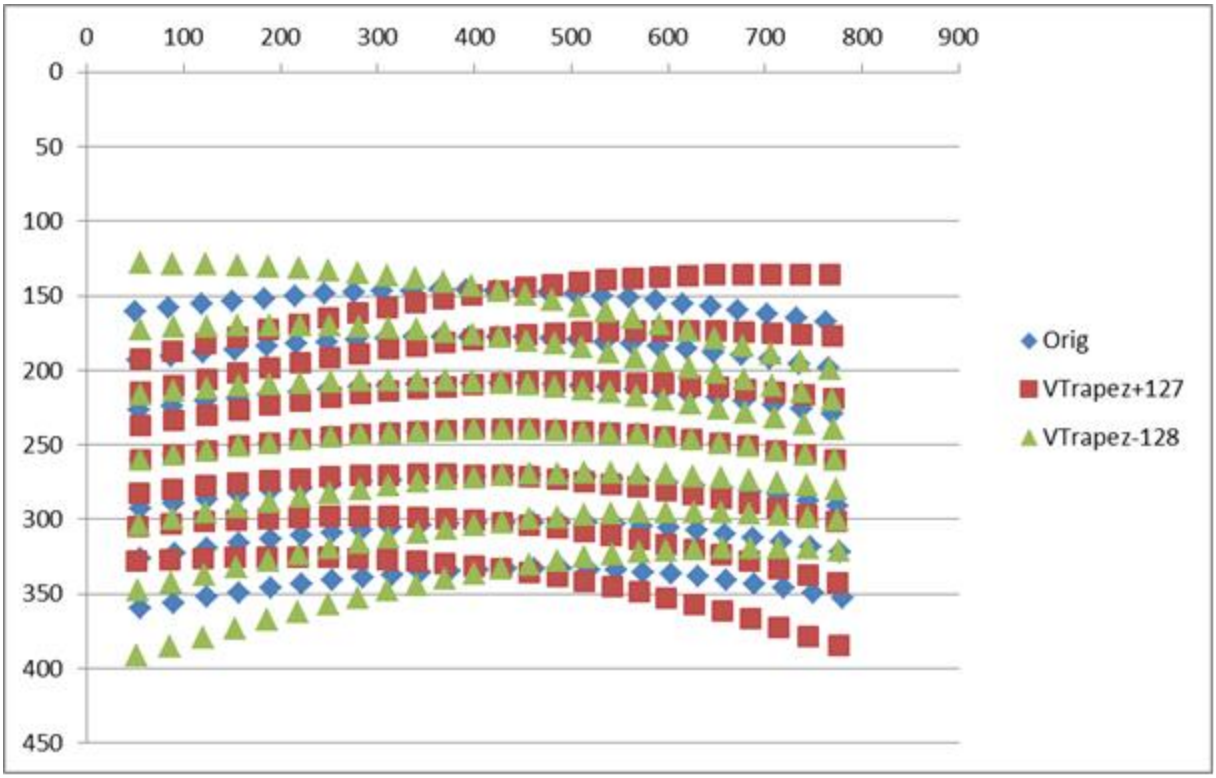
Asym Shear Horizontal Left



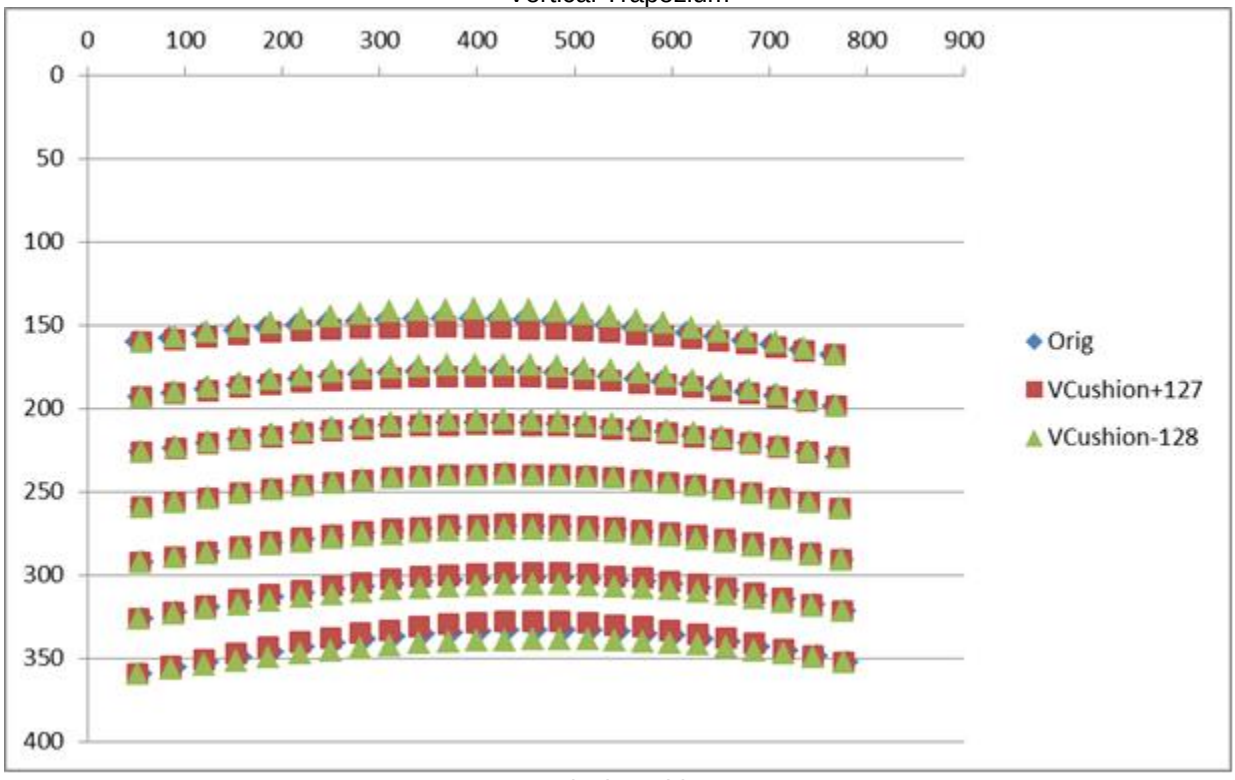
Asym Cushion Horizontal Right



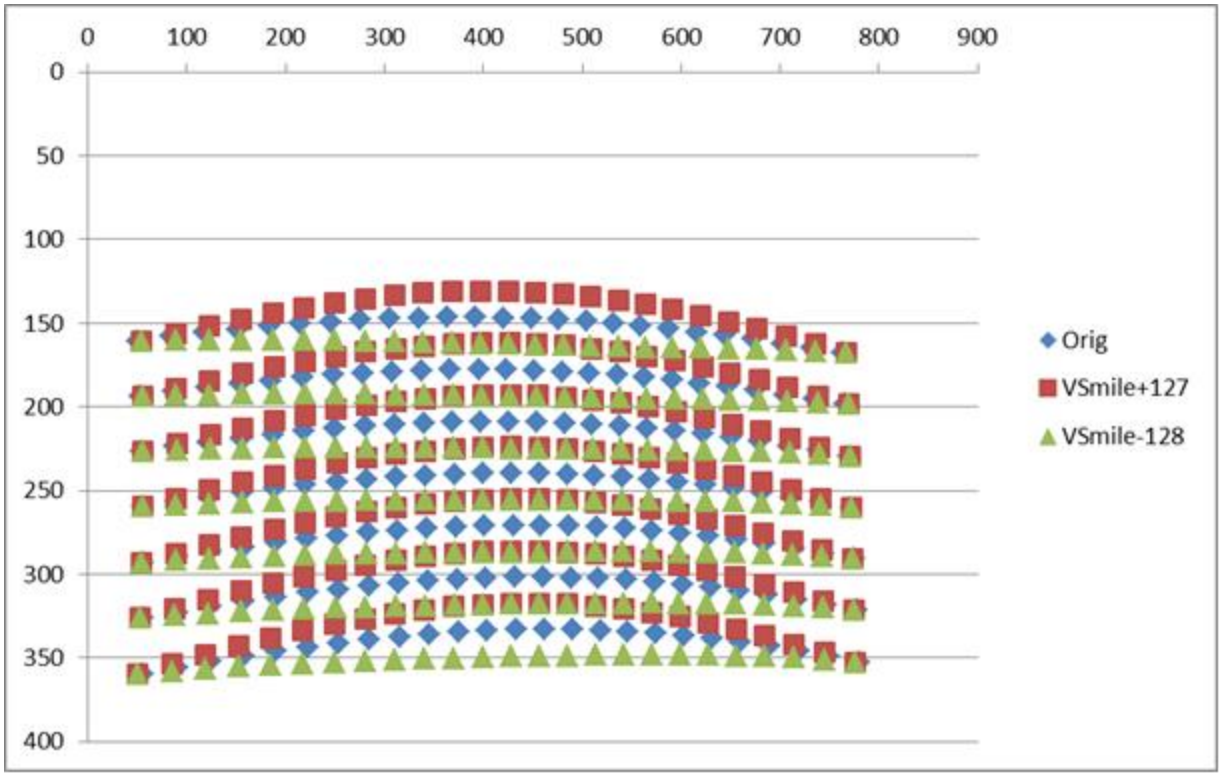
Asym Cushion Horizontal Left



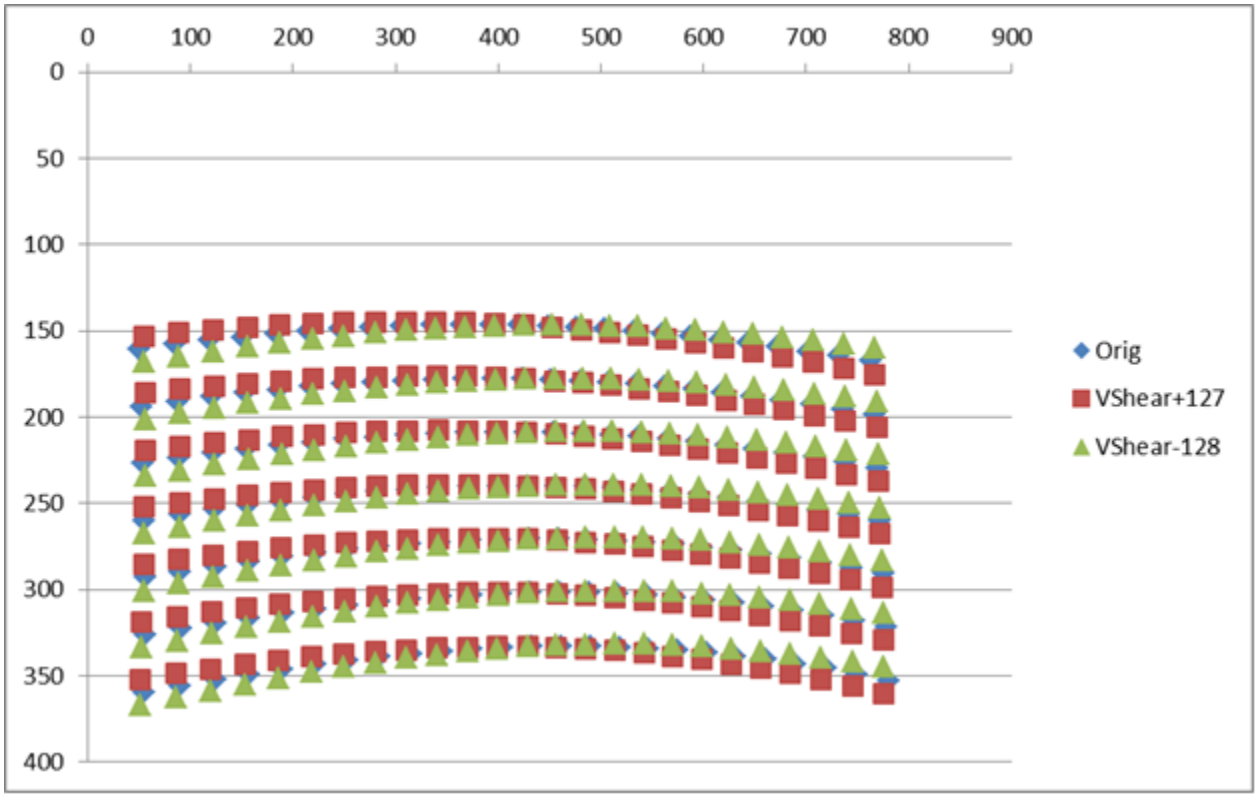
Vertical Trapezium



Vertical Cushion



Vertical Smile



Vertical Shear