SPECTRON

CONTROL LANGUAGE COMMANDS

SE1420 DASH
HUD/CRT DISPLAY MEASUREMENT SYSTEM

Version: 052804

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Spectron Control Language Commands:

List of SE1420 DASH SCL Commands and Reference

Command	Action	Section
*IDn?	Displays the System ID, Serial No. and Code Version	Setup
ABS(light)	Turns ABS light High, Low, or Off	Setup
ADA(ta)	Read binary image data.	Measurement
ALI(gn)	Align coordinate system to external reference.	Setup
ARE(a)	Take area Luminance measurement.	Measurement
AST(atus)	Reports the external BIT status after an ALIgn procedure.	Setup
ATI(ndex)	Read or Change the transform coefficients – Alpha, Beta, & DAZ	Setup
ATC(al)	Generates Alignment Tool Calibration parameters after boresight established with the CLIgn Command, below.	Setup
BDA(ta)	Read binary line data.	Measurement
CAR(ea)	Three color filter analysis of a color area	Measurement
CLI(gn)	Modified Alignment Procedure used specifically with HUD Simulator Calibration data to produce a boresight reference. This reference is used to calibrate the Alignment Tool with the ATCal Command, above.	Setup
DAR(k)	Take a new Dark current reading at preset gain.	Measurement
DDA(ta)	Read double precision line data.	Measurement
DIP(vergence)	Measures dipvergence and computes parallax	Measurement
DLU(minance)	Restore default luminance calibration.	Setup
FIL(ter)	Change the Neutral Density or Color Filter.	Setup
FOC(us)	Read or Move the focus position.	Positioning
GAI(n)	Change camera integration timing & take Dark.	Setup
GRA(phics)	Display the DASH camera image.	Measurement
GUP(date)	Refresh graphics thresholds & Display graphics.	Measurement
IST(est)	Perform Internal Self Test.	Setup

List of SE1420 DASH SCL Commands and Reference (continued)

Command	Action	Section
LAC(al)	Load Alignment CALibration Parameters into Alignment Present Parameters (present work space).	Setup
LAD(efault)	Load Alignment DEFault Parameters into Alignment Present Parameters (present work space).	Setup
LAF(ile)	Allow User to transfer first principle developed and saved Alignment Parameter file into Alignment Present Parameters for the HUD Simulator. (Not designed for keyboard entry).	Setup
LAS(tring)	Allow User keyboard input of first principle developed Alignment Parameters for the HUD Simulator into Alignment Present Parameters (present work space).	Setup
LAT(cal)	Load Alignment Tool CALibration factors for the Secondary Boresight Reference into Alignment Present Parameters (present work space).	Setup
LDA(ta)	Read single precision line data.	Measurement
LIN(e)	Take a line measurement.	Measurement
MTF	Take a Modulation Factor measurement.	Measurement
PAR(allax)	Reports Parallax at present focus transport position.	Measurement
PCA(libration)	Change the luminance calibration.	Setup
POS(ition)	Read or Move angular (Altitude & Azimuth) transports.	Positioning
RAC(alibration)	Read Alignment CALibration Parameters.	Setup
RAD(efault)	Read Alignment DEFault Parameters	Setup
RAP(parm)	Read Alignment Present Parameters (from present work area).	Setup
RCO(llimator)	Turn On or Off the reference collimators and displays status of the collimators	Setup

List of SE1420 DASH SCL Commands and Reference (continued)

Command	Action	Section
SAP(parm)	Saves Alignment Present Parameters to the Alignment CALibration parameters area of the EEPROM.	Setup
SCA(n)	Takes one scan (frame grab) at preset gain.	Measurement
SER(ial)	Read camera and transport serial numbers and software version number.	Setup
SET	Read or Change the current measurement settings.	Setup
STAtus	Read the status after an Internal Self Test (IST).	Setup
SVCamera	Save luminance calibration to EEPROM.	Setup
SYNc	Change the image capture synchronizing source.	Setup
XCA(libration)	Change the luminance calibration using Luminance Transfer Standard with EEPROM.	Setup

Spectron Control Language Commands:

Summary of SCL Commands and Results

Section 1, SE1420 DASH HUD/CRT Positioning Commands

SCL Command	Parameters / Range	Description	Example / Reply
FOCus	*None*	*Reports z-axis focus position*	*FOCus* *returns: X' 0.1237* Where X indicates the status of the focus transport axis, 0 = OK and 1 = Emergency stop.
FOCus	Z position range: ± 0.45 inches Attempt to enter a number outside the range will report nothing and the camera focus will not move.	Repositions the camera focus transport to the specified z-axis position. Note that this is an absolute position relative to the center of the focus transport.	*FOCus 0.124* returns: X ' 0.1239 Where X is 0 or 1, as above.
FOCus	AUTomatic	Automatically focuses the camera on a vertical line. Requires that a vertical line be in the camera's field of view.	*FOCus AUTomatic* returns: X ' 0.354 Where X is 0 or 1, as above.

Section 1, SE1420 DASH HUD/CRT Positioning Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
POSition	None	Returns the actual azimuth and altitude angular positions of the camera transport in degrees. Note that these are absolute positions relative to the present coordinate system 0,0 position and may be positive or negative.	*POSition* returns: XY'1.022' –1.125 Where X &Y indicate the status codes for the azimuth axis and the altitude axis respectively, 0 = OK and 1 = Emergency stop
POSition	Parm 1: Az (or X) position Parm 2: Alt (or Y) position HUD/CRT: ± 15º Alt & Az	Repositions the camera to the specified azimuth and altitude positions. Note that these are absolute positions relative to the present coordinate system 0,0 position and may be positive or negative. The actual transport position values are returned.	*POSition 1.023 -1.125* returns: XY'1.022 ' –1.125 Where X &Y indicate the status codes for the azimuth axis and the altitude axis respectively, 0 = OK and 1 = Emergency stop
POSition	ORG	Redefines the coordinate system so that PRESENT position will be offset and become the new position (0, 0). This user defined offset is only held in temporary memory and will be lost on power down.	*POSition ORG* returns: 00' –0.0000' –0.0000
POSition	ZERo	Removes the user defined offset generated from a POSition ORG command.	*POSition ZERo* returns: 00' –5.9911' 0.0226

Spectron Control Language Commands:

Summary of SCL Commands and Results

Section 2, SE1420 DASH HUD/CRT Setup Commands

SCL Command	Parameters / Range	Description	Example / Reply
*Idn?	None	Displays the System ID, Serial Number, and Code Version.	*IDN? Return Example: SpectronEngineering, SE1420, SN:12345, S_23s2A
ABSlight	None	Reports the status of the ABS light source.	ABSlight Return Examples: 0' ABS Light Source is OFF 1' ABS Light Source is LOW 2' ABS Light Source is HIGH
ABSlight	HIGH	Turns the ABS light source on -- HIGH.	ABSlight HIGH return: nothing
ABSlight	LOW	Turns the ABS light source on – LOW.	ABSlight LOW return: nothing
ABSlight	OFF	Turns the ABS light source off.	ABSlight return: nothing
ALIgn	None	Performs an alignment measurement then calculates the transform constants. Daz, Alpha, Beta.	ALIgn returns: Two digit status code, a single quote delimiter, and a text string (see ALIGN status codes & text strings at end of Section 2) Return Examples: 00'ALIGN OK – CAL DUE DATE 20050110 Note: See ALIGN FAIL Status Codes below.

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
ALIgn	APParm	Performs an ALIgn using the Alignment Present Parameters stored in the present work area.	*ALIgn APParm* Return: 00' ALIGN OK
ALIgn	7 Parameters: #1 Align input one, Azimuth offset (Daz) in thousandths of a degree. #2 Align input two, Elevation offset (Alpha) in thousandths of a degree. #3 Align input three, Roll offset (Beta) in thousandths of a degree. Optional for non standard alignments: #4 Left cross Elevation in SEI coordinates. #5 Left cross Azimuth in SEI coordinates. #6 Right cross Elevation in SEI coordinates. #7 Right cross Azimuth in SEI coordinates.	Performs a HUD Simulator tool Calibration. May be used for Direct display tools or HUD tools. Makes an alignment measurement then calculates and returns the transform constants. Daz, Alpha, Beta. The alignment inputs, parameters #1, #2 and #3 are integers representing the number of thousandths of degrees of offset. The leading digit represents the sign of the offset where 1 equals minus and 0 equals plus. The 7 parameter version of this command can be used with either direct or infinite sources. The gain and focus should be set before running the command as these are not programmed in this mode.	*ALIgn 0 0 0 0.015 –4.430 -.022 4.441* returns: Two digit status code, a single quote delimiter, and a text string (see ALIGN status codes & text strings at end of Section 2) Return Examples: 00'ALIGN OK Note: See ALIGN FAIL Status Codes below.

Section 2, SE1420 DASH HUD/CRT Setup Commands (continues)

SCL Command	Parameters / Range	Description	Example / Reply
ASTatus	None	Reports the External BIT Status results generated by the ALIGN Procedure according to status codes associated specifically with this command.	*ASTatus* Return: 50' ASTATUS OK Note: Error reports are listed specifically in Status Codes 51-55 as described below.
ATCal	none	Returns Alignment Parameters and preserves results for LATcal if relevant for EEPROM save to secondary standard.	*ATCalibration* returns: 1104'023'09 or status codes 11 to 19 (see ALIGN status codes & text strings at end of Section 2)
ATIndex	none	Reads out the Alpha, Beta and Daz translation constants currently set.	*ATIndex* returns: 0.105'–0.078'1.114
ATIndex	Parameters: #1 Alpha- Y translation in signed degrees. #2 Beta- Roll translation in signed degrees. #3 Daz- X translation in signed degrees.	Input Alpha Beta and Daz to simulate running an Alignment procedure (which alternately generates these same variables).	*ATIndex 0.105 –0.078 1.114* returns: 0.105'–0.078'1.114
ATIndex	0 0 0	Forces the translation constants to zero. This is the same state as on power on.	*ATIndex 0 0 0* returns: nothing

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
CLIgn	None	Performs a HUD Simulator Alignment. Makes 8 sets of measurements then calculates the transform constants. Daz, Alpha, Beta.	*CLIgn* returns: Two digit status code, a single quote delimiter, and a text string (see ALIGN status codes & text strings at end of Section 2) Return Examples: 00'ALIGN OK Note: See ALIGN FAIL Status Codes below.
CLIgn	7 Parameters: #1 Align input one, Azimuth offset (Daz) in degrees. #2 Align input two, Elevation offset (Alpha) in degrees. #3 Align input three, Roll offset (Beta) in degrees. #4 Left crosshair Elevation in SEI coordinates. #5 Left crosshair Azimuth in SEI coordinates. #6 Right crosshair Elevation in SEI coordinates. #7 Right crosshair Azimuth in SEI coordinates.	Performs a HUD Simulator Alignment. May be used for Direct display tools or HUD tools. Makes 8 sets of measurements then calculates and returns the transform constants. Daz, Alpha, Beta. The 7 parameter version of this command can be used with either direct or infinite sources. The gain and focus should be set before running the command as these are not programmed in this mode.	*CLIgn -0.044 –0.024 0.015 0.007 –5.982 – 0.012 6.002* Return Example: 00'ALIGN OK Note: See ALIGN FAIL Status Codes below

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
DLUminance	None	Restores the default factory calibration to the Luminance calibration factors. Can be used to overcome an inappropriate use of the PCAl command.	*DLUminance* *DLU* returns: 4 decimal factor 'P*rior*' and a 4 decimal factor 'D*efault*'. The default luminance value has been stored in RAM and will only be saved by the SVC Command. Otherwise, the value on the next start up will revert to the prior luminance value. Return Example: P '0.0124 'D' '0.0098
FILter	ND filter 0, 1 or 2 (Neutral Density)	Sets the Neutral Density Filter wheel.	*FILter 1* returns: nothing
	Color Filter WHIte, BLUe, RED, or GREen	Sets the Color Filter Wheel	*FILter GREen* returns: nothing
GAIn	Integration Time 1 to 2048	Sets the integration time and takes a new dark reference reading.	*GAIn 16* returns: nothing
ISTest	None	Initiates Internal Self Test. This command is generally followed by a STAtus command	*ISTest* returns: T
LACal	None	Loads Alignment CALibration Parameters into Alignment Present Parameters (present work space).	*LACal* *returns: 44' LOAD ALIGN CALIB OK*
LADefault	None	Loads Alignment DEFault Parameters into Alignment Present Parameters (present work space).	*LADefault* *Returns: 40' LOAD ALIGN DEFAULTS OK*

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
LAFile	Alignment Parameters (Command and Parameters contained in text file only)	This command is not designed to be entered from the keyboard, but is used at the beginning of a text file transferred via RS232 communications to the SE1420 DASH or through IEEE488. It allows the User to quickly transfer previously developed and saved Alignment Parameter files from 1st principle HUD Simulator calibration to the Alignment Present Parameters (present work space).	*When a Alignment Parameter File is transferred to the SE1420 DASH one of the following returns may be expected:* *42' LOAD ALIGN FILE OK* *OR* *31' LOAD ALIGN FILE INPUT ERROR*
LAString	Alignment Parameters Note: 1: First 3 parameters are decimal numbers representing azimuth, altitude and roll offsets.. 2: The 'STRING' indicates the data was input from the keyboard. 3: The date should be entered in the form 'yyyymmdd'. 4: The '1001' data is a numerical indication of the Source where 1001 represents the keyboard. 5: The last data item represents the Target SN: of the Alignment Tool in use.	Allows User keyboard input of Alignment Parameters for the HUD Simulator into Alignment Present Parameters (present work space).	*LAString 0.015 –0.430 –0.852 STRING 20040130 1001 03521* *Returns: 41' LOAD ALIGN STRING OK* *If there is a detectable error in the keyboard input string, a return as follows will occur:* *30' LOAD ALIGN STRING INPUT ERROR* *and the Alignment Present Present Parameters (present work space) will remain unchanged.*

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	Parameters / Range	Description	Example / Reply
LATcal	None Note: This Command will only be effective if a valid CLI Command has been achieved with the HUD Simulator. This ensures that only valid Alignment Tool data is transferred into the present work space through the use of this command.	This Command loads the Alignment Tool CALibration results (secondary boresight reference) into Alignment Present Parameters (present work space).	*LATcal* *Returns: 43' LOAD ALIGN ATCAL OK* *OR* *32' NO LOAD, INVALID ATCAL ERR*
PCAlibration	desired luminance value decimal number	Calibrates luminance of AREa and peak brightness (fourth parameter in LINe command output) to desired luminance value (decimal number) input. NOTE: Care should be taken changing this calibration. A calibrated photometer of the correct spectroradiometric or photometric response must be <u>carefully</u> used on a well controlled/stable light source as a transfer standard. Also, an AREa command must be carefully executed on the exact part of the source measured with the photometer BEFORE the PCAlibrate command is initiated. This luminance calibration is held in temporary memory and will be lost on power down unless it is saved using the SVCamera command.	*PCAlibration 121.3* returns: nothing
RACal	None	Reads Alignment CALibration Parameters.	*RACal* *Return: -0.1107' –0.1374' –0.3942' CALIB' 20050110' 3483' 3448*

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
RADefault	None	Reads Alignment Default Parameters.	*RADefault* *Return: 0.0100' 0.0200' 0.0300' DEFAULT' 20040102' 9999' 03448*
RAPparm	None	Reads Alignment Present Parameters (from present work area).	*RAPparm* *Return: -0.1107' –0.1374' –0.3942' CALIB' 20050110' 3483' 3448*
RCOllimator	None	Returns the status of the light source connected to the accessory cable.	*RCOllimator* *Return Examples:* *1' Reference Collimator(s) are ON* *0' Reference Collimator(s) are OFF*
RCOllimator	ON	Turns on the collimated light sources connected to the accessory cable.	*RCOllimator ON* Return: nothing
RCOllimator	OFF	Turns off the collimated light sources connected to the accessory cable.	*RCOllimator OFF* Return: nothing
SAPparm	None – for 1st principle transfer to the HUD Simulator.	Saves Present STRING or FILE Alignment parameters to the Alignment CALibration parameters area of the HUD Simulator EEPROM.	*SAPparm or SAPparm 20050130* Return: 45' CALIBRATION SAVE OK Note: Unsuccessful save attempts will be indicated by specific message strings found in error Status Codes 33-38, below.

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
SAPparm	Calibration Due Date for 'ATCAL' Transfer to the Secondary Boresight Reference.	Saves Present STRING or FILE Alignment parameters to the Alignment CALibration parameters area of the Secondary Boresight EEPROM.	*SAPparm or SAPparm 20050130* Return: 45' CALIBRATION SAVE OK Note: Unsuccessful save attempts will be indicated by specific message strings found in error Status Codes 33-38, below.
SERial	None	Returns the serial numbers of the Camera and Transport as saved in the EEPROM pages in each module and the software Version number.	*SERial* returns: CCCCC'XXXXX'VVVVVV where CCCCC= the camera serial number, XXXXX = the transport serial number, and VVVVVV = the software version number.
SET	none	Returns setup parameters for the camera: 1) Camera integration time (gain) = 1 to 2048 2) ND filter wheel position = 0 or 1 or 2 3) COLOR filter wheel position = W(hite), R(ed), G(reen), B(lue) or N(ot installed) 4) Synchronization (VSYNC) type = X(ternal) or P(rovided) 5) Actual lens position = F(inite) or I(nfinite) 6) Setup required lens position = F(inite) or I(nfinite) 7) Setup of color analysis = C(olor) for shadow mask analysis or M(onochrome) for NO shadow mask analysis 8) Setup Number (Default Setup Number is 3 and may not be changed by User.)	*SET* returns: 1'0'N'X'F'F'M'3

Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	Parameters / Range	Description	Example / Reply
STAtus	None	Verifies the operating condition of the machine. This command is generally preceded by an IST command.	*STAtus* returns: 60' STATUS OK Failures are reported with specific Status Codes 61-64, below.
SVCamera	None	Saves the newest PCAlibration, to be used on power-up. NOTE: 'LED ON' appears in the lower right hand corner of the DASH Controller when the SVCamera command is properly sent and received as an indication that the EEPROM is written	*SVCamera* returns: nothing
SYNc	INTernal	Uses vertical sync pulses from controller (~60 Hz) to supply timing source. Can be used for non-pulsed image luminance meaurement when the camera to image synchronization is not important for consistent luminance measurements.	*SYNc INTernal* returns: nothing
SYNc	EXTernal	Uses vertical sync pulses from external display source being measured to maintain camera to image synchronization and timing	*SYNx EXTernal* returns: nothing

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Section 2, SE1420 DASH HUD/CRT Setup Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
XCAlibration	Luminance value in foot Lamberts measured from the Luminance Transfer Standard using a calibrated photometer. decimal number – XXX.XX	Changes luminance output for AREa brightness and peak brightness (fourth parameter in LINe command output) to desired luminance value (input decimal number). Note 1: The Luminance Transfer Standard must be on and stabilized for 20 minutes prior to photometer measurement. The XCA command does NOT turn on the Luminance Transfer Standard. Note 2: Care should be taken changing this calibration. A calibrated photometer of the correct spectroradiometric or photometric response must be <u>carefully</u> used on the Luminance Transfer Standard. Note 3: The luminance calibration is held in temporary memory and will be lost on power down unless it is saved using the SVCamera command.	*XCAlibration 121.34* returns: 70' XCAL OK Failure is indicated by error codes 71 – 76, below.

Alignment (ALIGN) Status Codes and Text Strings

Status code	text string
00	ALIGN OK
11	ALIGN FAIL - INPUT ERROR
12	ALIGN FAIL - LENS POSITION ERROR
13	ALIGN FAIL - SET NUMBER ERROR
14	ALIGN FAIL - NO EOF
15	ALIGN FAIL - NO VSYNC
16	ALIGN FAIL - LOW LIGHT, NO LINE IN FOV
17	ALIGN FAIL - HALF LINE IN FOV
18	ALIGN FAIL - SHUTTER MALFUNCTION
19	ALIGN FAIL – EEPROM NOT PRESENT
20	ALIGN FAIL – ACCESSORY TYPE ERROR

EEPROM ALIGN Procedures Status Codes and Text Strings

Status code	text string
30	LOAD ALIGN STRING INPUT ERROR
31	LOAD ALIGN FILE INPUT ERROR
32	NO LOAD, INVALID ATCAL ERR
33	NO SAVE, ACCESSORY TYPE ERR
34	NO SAVE, PARAMETER TYPE ERR
35	NO SAVE, DUE DATE INPUT ERR
36	NO SAVE, EEPROM NOT PRESENT
37	NO SAVE, ACCESSORY TARGET ERR
38	NO SAVE, ACCESSORY SOURCE ERR
40	LOAD ALIGN DEFAULTS OK
41	LOAD ALIGN STRING OK
42	LOAD ALIGN FILE OK
43	LOAD ALIGN ATCAL OK
44	LOAD ALIGN CALIB OK
45	CALIBRATION SAVE OK

External BIT Status Codes and Text Strings (ASTATUS)

Status code	text string
50	ASTATUS OK
51	ASTATUS FAIL – CHECK ACCESSORY & RERUN ALIGN BEFORE REPAIR
52	ASTATUS FAIL – CAMERA, RERUN ISTEST & ALIGN BEFORE REPAIR
53	ASTATUS FAIL – SYSTEM, RERUN ISTEST & ALIGN BEFORE FACTORY RECALIBRATION
54	ASTATUS FAIL – SYSTEM, RERUN ISTEST & ALIGN BEFORE LUMINANCE RECALIBRATION
55	ASTATUS FAIL – ALIGN NOT RUN, NO STATUS

Internal BIT Status Codes and Text Strings (STATUS)

Status code	text string
60	STATUS OK
61	STATUS FAIL – XPORT, RERUN ISTEST BEFORE REPAIR
62	STATUS FAIL – CAMERA, RERUN ISTEST BEFORE REPAIR
63	STATUS FAIL – CONTROLLER, RERUN ISTEST BEFORE REPAIR
64	STATUS FAIL – POWER SUPPLY, RERUN ISTEST BEFORE REPAIR

Luminance Status Codes and Text Strings (XCAL)

Status code	text string
70	XCAL OK
71	XCAL FAIL – INPUT ERROR
72	XCAL FAIL – NOT ALIGNED
73	XCAL FAIL – EEPROM, CHECK ACCESSORY & RERUN
74	XCAL FAIL – ACCESSORY TYPE ERR
75	XCAL FAIL – LOW LIGHT, REMOVE OBSTRUCTIONS & RERUN
76	XCAL FAIL – HIGH LIGHT, ELIMINATE AMBIENT LIGHT & RERUN

Spectron Control Language Commands:

Summary of SE1420 DASH HUD/CRT SCL Commands and Results

Section 3, SE1420 DASH HUD/CRT Measurement Commands

SCL Command	Parameters / Range	Description	Example / Reply
ADAta	WARNING! Improper use of this command will lock up the system. USE CAREFULLY!	This command causes the latest. image to be transmitted in BINARY form over the GPIB Interface.	*ADAta* returns: 12544 Binary Bytes
AREa	none	Default. Takes a photometer reading of a 64 X 64 pixel area.	*AREa* returns: XX '102.3 (where "XX" represents a Camera Status Codes defined at end of Section 3)
AREa	Pixel Area 16, 32, or 64	Takes a photometer reading. The parameter specifies the size of the area in pixels, such as 32 pixels by 32 pixels.	*AREa 32* returns: same as above
BDAta	WARNING! Improper use of this command will lock up the system. USE CAREFULLY!	This command causes the latest Line scan to be transmitted in BINARY form over the GPIB Interface.	*BDAta* returns: 112 Binary Bytes
CARea	none	Does three color filter analysis of a color area for specific display phosphors. The first number returned is the camera status code, the second number is the color luminance, the third is u', and the fourth number is v'.	*CARea* returns: XX '1546.73' 0.4321' 0.3215 (where "XX" represents a Camera Status Codes defined at end of Section 3)
DARk	none	Takes a dark reference reading.	*DARk* returns: nothing
DDAta	none	Returns a double precision decimal ASCII string of the latest line data. (Range is 0.xx to 255.xx)	*DDAta* returns: pixel brightness values of last line analysis, single quote (') delimited. (5.34'14.78'127.89…)

Section 3, SE1420 DASH HUD/CRT Measurement Commands (continued)

SCL Command	*Parameters / Range*	*Description*	*Example / Reply*
DIP(vergence)	None	Measures dipvergence and computes parallax. Command Requirements: 1. Crosshair in FOV (Field-Of-View. 2. Gain must be set to a reasonable value (neither DIPvergence or FOCus AUTomatic will adjust the gain). 3. Crosshair in PRECISE focus – autofocus recommended. Note: Both dipvergence and parallax outputs are in milliradians/2.5" delta eye position. Note: Failure may be due to crosshair not in Field of View.	*DIPvergence* Return Example: 0.603' 1.397 Fail Indication: 70' LINE ANALYSIS FAILURE
GRAphics	none	Causes the video monitor to display the camera's view as a four-gray scale graphic.	*GRAphics* returns: nothing
GUPdate	none	Recalculates the threshold amplitudes for the 4 gray scale display discussed above.	*GUPdate* returns: nothing
LDAta	none	Returns a single precision decimal ASCII string of the latest line data. (Range is 0 to 255)	*LDAta* returns: pixel brightness values of last line analysis, single quote (') delimited. (5'14'127 …)
LINe	none	Default. Does a 64 line wide analysis of a vertical line which includes the line center, line width, and line peak brightness.	*LINe* returns: XX 'LC' 1.0201 'LW' 0.0100 'PB' 52.0 (where "XX" represents a camera status code defined below)

Section 3, SE1420 DASH HUD/CRT Measurement Commands (continued)

SCL Command	Parameters / Range	Description	Example / Reply
LINe	Line Orientation (Parm 1) VERtical or HORizontal	Analyzes a vertical or horizontal line with default Parm 2 of 64 line wide analysis including the line center, line width, and line peak brightness.	*LINe VERtical* returns: same as above
LINe	Width of Analysis (Parm 2) 1, 16, or 64	Specifies the width of the analysis including the line center, line width, and line peak brightness.. Parm 1 (VERtical or HORizontal) must be present in the command string before this Parameter.	*LINe HORizontal 16* returns: same as above
MTF	Line Orientation (Parm 1) VERtical or HORizontal	Defaults to a 64 line wide analysis of a vertical or horizontal line pattern and calculates the modulation factor.	*MTF VERtical* returns: XX '90.3 (where "XX" represents a camera status code defined below)
MTF	Width of Analysis (Parm 2) 1, 16, or 64	Specifies the width of the analysis including the vertical or horizontal Modulation Factor. VERtical or HORizontal must be present in Parm 1 of the command string before this Parameter is appended and used.	*MTF HORizontal 16* returns: same as above
PARallax	None	Reports Parallax in Diopters of the present focus transport position. Precise focus of a specific feature is necessary to determine image position. Autofocus on Vertical Line is recommended.	PARallax Return example: 0.037
SCAn	none	Causes the Camera to take one scan. Does not perform any measurements.	*SCAn* returns: nothing

Camera Status Codes

00 = no error, OK - no GPIB msg, data output

01 = no EOF *MSG* ="CAMERA NOT PRESENT, CHECK CABLE"

02 = no vsync *MSG* = "NO SYNC! CHECK INPUT IF EXTERNAL"

03 = vsync frequency out-of-range = 47.5 Hz > VSYNC < 63 Hz -
  no GPIB msg, data output

04 = vsync unstable > 1.17% delta - no GPIB msg, data output

05 = no line *MSG* = "NO LINE IN FIELD OF VIEW"

06 = saturation - at least 1 pixel in average is $FF raw data -
  no GPIB msg, data output

07 = luminance level (inside window for line) is < 10% of the
  dynamic range - no GPIB msg, data output

08 = luminance level (inside window for line) is < 30% of the
  dynamic range - no GPIB msg, data output

09 = actual lens position differs from setup configuration wanted for lens
        MSG = "LENS POSITION & SETUP DIFFER"