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| **VIDEO DISPLAY UNIT B3**  **STELS PART NO: 2200298216**  **ACCEPTANCE TEST PLAN** | | | |
| **APPROVED BY** | | | |
|  | | | |
| **NAME** | **DESIGNATION** | **SIGNATURE** | **EFFECTIVE DATE** |
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**Change Index.**

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# Overview

This document stipulates and the functional qualification test setup procedures for Video Display Unit (abbreviated as VDU B3 here after). This document will be used as a guideline to qualify the operational functional and characteristics of VDU B3 in according to the technical specification requirement and defined in the document of SSRS REQ-328-JH-0005\_A\_REV\_3 for Video Display Unit B3.

# Test Equipment, Setting and Matrix

The following equipment and facilities are required for testing.

* DC power supply, output range from 18V ~ 32V, current rating at 2A@24VDC
* A PC or Laptop, with test software.
* Oscilloscope is to measure the ripples of the camera outputs.
* Video signal generator is to generate 4 channels HD-SDI signals / SD-SDI signals.
* HD-SDI Camera
* Ruler
* Weighing device

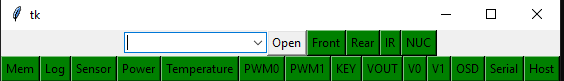
## 2.1 Test Setup



# 

## 2.2 Control Button Software Test

The Phyton test software will be used for VDU B3 control button to test the functional key and responding for the results according to the test procedure 3.13.



**Figure:2 Test Software**

Table 1. VDU B3 Characteristics and functions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/N** | **Category** | | | **Characteristics** | **Test Procedure & Test Method** |
| **1** | **Physical specifications** | | | | |
| Visual inspection | | | Refer to Mechanical Drawing | **Procedure 3.1** |
| **Physical Characteristics Measurement** | | | |  |
| External dimension of Unit ( L x W x H) | | | 220mm x 150mm x 65mm | **Procedure 3.1** |
| Weight | | | < 2 kg |
| Mounting dimension | | | Refer Mechanical drawing |
| **2** | **Electrical specifications** | | | | |
| Input Vehicle Power supply | Operating voltage range | | 18V ~ 32V | **Procedure 3.2** |
| Peak Current rating | | <2A for <1sec @ 24VDC |
| Continuous current rating | | <1A @ 24VDC |
| **3** | **System Start-up time** | | | <20S | **Procedure 3.3** |
| 4 | **Reverse Polarity Test** | | | 0A | **Procedure 3.4** |
| 5 | **Video Latency test** | | | Expected results <50ms | **Procedure 3.5** |
| **6** | **Video IO characteristics** | | | | |
| Digital video input x 2 CH. | | Resolution | SD video, 720x576pixels@25fps  HD video, 1920x1080pixels@30fps  All in SMPTE format | **Procedure 3.6** |
| Data format |
| Frame Rate |
| **7** | **Video flickering test** | | | Observe the video no flicker on the LCD | **Procedure 3.7** |
| **8** | **Video Smearing test** | | | Observe the video no smearing on the LCD | **Procedure 3.8** |
| **9** | **LCD Pixel Defects** | | | To Check the LCD pixel defects | **Procedure 3.9** |
| **10** | **Video Resolution test** | | | To check the Resolution. | **Procedure 3.10** |
| **11** | **Video contrast test** | | | To check the Contrast. | **Procedure 3.11** |
| **12** | **Video Brightness test** | | | To check the brightness | **Procedure 3.12** |
| **12** | **Control Buttons** | | | | **Procedure 3.13** |
| **12.1** | 1. Front Camera view toggle. | | | Press the button to front mode. |
| **12.2** | 2. Rear Camera view toggle. | | | Press the button to Rear mode. |
| **12.3** | 3.IR illuminator ON/OFF toggle. | | | Press the button to IR mode. |
| **12.4** | 4. NUC trigger. | | | Press the NUC button to check. |
| **12.5** | 5. Night Mode toggle. | | | Press the Button to night Mode. |
| **S/N** | **Category** | | | **Characteristics** | **Test Procedure & Test Method** |
| **12.6** | 6. Dimmer “- “button. | | | LCD backlight dimmer, brightness number decrease |  |
| **12.7** | 7. Brightness “+” button. | | | LCD backlight brighter, brightness number increase. |
| **12.8** | 8. Menu. | | | Press the Button to check functions settings. |
| **12.9** | 9. Power Button. | | | Press ON/OFF toggle.2 sec Holding default on. |
| **13** | **RS422 control test** | | | Phyton software to conduct the test to RS422 port. | **Procedure 3.14** |
| **14** | **USB Debugging port test** | | | Tera Team software to conduct the test to USB port. | **Procedure 3.15** |
| **15** | **Ethernet connection** | | | Laptop to observe the Ethernet speed | **Procedure 3.16** |
| **16** | **System BIT test** | | | Check VDU B3 ID and firmware version | **Procedure 3.17** |
| **17** | **Degraded or Emergency Operation Mode test** | | Disconnect the Video input A | NO SIGNAL Blue screen when disconnected.  Normal operation when connected. | **Procedure 3.18** |
| Disconnect the Video input B |
| **18** | **Visual Inspection & Documentation** | | | Software version & E Box | **Procedure 4.0** |

# Test Procedure

The VDU B3 Box shall be completely assembled and must ensure the box in good condition to support for testing.

The software version 1.0.1 should be programmed promptly in the memory of VDU B3 Box.

Confirm the harness cables under working condition.

## 3.1 Physical Specification

### 3.1.1 Visual Inspection

* External outlook check, the box should be clear without any rust. The connectors should be secured properly on the box. The external painting / coating surface should be clean without scratch or dirties on its surface
* All components should be located on the correct position with correct orientation, without any damage or loose.
* The screws on the surface should be secured at respective level. Secured torque check should be conducted if necessary.

### 3.1.2 Physical Characteristics Measurements

* Physical external dimension size (W x H x D)
* Physical mass of the VDU B3 assemblies
* Mounting dimension of the boxes
* Record the result in Appendix 2.

## 3.2 Operating Power

Before power on the DC power supply, set voltage 28V at current rating 3A (Figure1).

* Power on the power supply.
* Adjust the DC power supply voltage to 18V, check that the VDU B3 remain in operation.
* Adjust the DC power supply voltage to 32V, check that the VDU B3 remain in operation.
* Adjust the DC power supply voltage to 28V, check that the VDU B3 remain in operation.
* Record the result in Appendix 2.

## 3.3 System Start up Test

This test shall be conducted at 28VDC

* Start the stop watch and power up the system in the same time.
* The time is counting when the system power up at the end. Stop the stop watch while system is connected.
* The result shall be <20sec.
* Record the result

## 3.4 Reverse Polarity Protection Test

To check the reverse polarity Protection test.

* Change the negative input to Vin+ and positive input to Vin -.
* Result current should be =0mA.

## 3.5 Video Latency Test

Using a signal generator to generate a black screen and using an oscilloscope to measure the signal, and change to generate a white screen to replace black screen, compare the signal in the oscilloscope to identify the latency.   
To test the latency of the video / image displayed from the LCD and record the result.

**Expected Result: < 50ms**

## 3.6 Video IO characteristics

Digital video input 2 channel to setup, Resolution, data format& frame rate

* SDI Video input 576i@50 (720x576pixels @25fps)
* HD video input 1920x1080pixels@30fps.

## 3.7 Video Flickering Test

The video / image displayed by the LCD should not have any flickering during operating. The result of test should be recorded.

| Test Input | Expected Result |
| --- | --- |
| Observe the video displayed of the LCD | LCD- No image flickering |

Video Flickering Test

## 3.8 Image Smearing Test

The video / image displayed by the LCD should not have any image smearing during operating. The result of test should be recorded.

| Test Input | Expected Result |
| --- | --- |
| Observe the video displayed of the LCD | LCD- No image smearing |

Image Smearing Test

## 3.9 LCD Pixel Defects

The Test performed to check the pixel defects of LCD.

* Select the video generator 1427 select Raster, detail, select color.
* Video input black image, Inspect for any pixel on the VDU B3 display.
* Video input white image, Inspect for any pixel on the VDU B3 display.
* Video input red image, Inspect for any pixel on the VDU B3 display.
* Video input green image, Inspect for any pixel on the VDU B3 display.
* Video input blue image, Inspect for any pixel on the VDU B3 display.
* Record the result in Appendix 2. Max of 3-pixel defect allowed on Display panel.

## 3.10 Display Resolution Test

Test the VDU display resolution by the signal generator (VG-871B). Setup the signal generator to MONOSCOPE & ASPECT mode by select “AFD” or MONOCOPE button on the signal generator.

| Test Input | Expected Result |
| --- | --- |
|  | Able to read the lines and numbers on the red arrow mark. |
|  | ASPECT MODE - able to read Ratio 16:9 |

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## 3.11 Display Contrast Test

Test the VDU display contrast test by the signal generator (VG-871B). Setup the signal generator to MONOSCOPE mode by select “MONOSCOPE” button on the signal generator.

| Test Input | Expected Result |
| --- | --- |
| Contrast set to 50 (Picture:1) | Able to read the contrast bar level from 1 to 11. |
| Contrast set to 100 (Picture:2) | Able to read the contrast bar level from 9 to 11 at red arrow mark. |
| Contrast set to 0 (Picture:3) | Able to read the contrast bar level from 1 to 3 at red arrow mark. |

## 3.12 Display Brightness Test

Test the VDU B3 display Brightness test by the signal generator (VG-871B). Setup the signal generator to COLOUR mode by select “WHITE” button on the signal generator. Use the Luminous meter to measure the luminance level of VDU B3 LCD display.

| Test Input | Expected Result |
| --- | --- |
| brightness set to 0 | 23 Lux |
| Brightness set to 100 | 544 LUX |

## 3.13 VDU IO operation test

**Panel Discrete Input Button Test**

On the PC control button software (Figure 1) to test the VDU B3, consists 9 input buttons. To conduct the functional test and record the results (Appendix 2).

| Test Input | Expected Result |
| --- | --- |
| Press the Button 1 (Front view) | Current video change to Front view |
| Press the Button 2 (Rear view) | Current video change to Rear view |
| Press the Button 3(IR Illuminator) | IR able to control by this button |
| Press the Button 4 (NUC) | NUC icon existed on the LCD screen |
| Press the Button 5 (NVG) | NVG function activated |
| Press the Button 6 (-) | Selection for LCD dimmer |
| Press the Button 7 (+) | Selection for LCD brightness. |
| Press the Button 8 (Menu) | To select the menu -Function Setting |
| Press the Button 9 (Power ON/OFF) | Press 2 sec to power off the VDUB3 |

Penal Discrete Input Button Test

## 3.14 RS422 Control Test

Launch “Tera Team” and set com to 115200, 8, N, 1, N. The terminal module able to connect the VDU B3 through the RS422 port to PC terminal. (J1 Connector)

| Test Input | Expected Result |
| --- | --- |
| Established the connection between VDU J2 connector to PC terminal module (use-RS422 convertor) | Able to read and write in the system. |

RS422 Control Test

## 3.15 USB Debugging port Test

To test the USB debugging port, use the Tera Team test software to test. The terminal module able to connect the VDU B3 through the USB debugging port and read and write (J2 Connector).

| Test Input | Expected Result |
| --- | --- |
| Established the connection between the VDU B3 connector J1 USB to PC terminal module. | PC terminal module able to read and write the command in the VDU through USB2.0 debugging port without connection issue. |

USB2.0 Debugging Port Test

## 3.16 Ethernet Connection Test

Connect the VDUB3 GigE ports to Laptop, observe the ethernet speed and record test result.

| Test Input | Expected Result |
| --- | --- |
| Connect and check the Ethernet connection speed status in the PC. | < 1Gbps |

Ethernet Connection Test

## 3.17 System BIT Test

### Launch the **Tera Team** software to setup 115200 and set com to 8, N,1, N to test the firmware version.

* J1 Connector\_ USB port to connect the PC terminal.
* Testing Firmware command: **b3vdu-stream -v**
* Firmware version should be 1 0 1
* Record the result.

Launch the **Phyton test software** to test the BIT test, Disconnect the SDI inputs individually when system in normal status. The test software would show the corresponding input fault one by one (Figure 1).

* J2 Connector\_ RS422 port to connect the PC terminal.
* Record the result

| Test Input | Expected Result |
| --- | --- |
| Legend: Green – Pass /Red- fault |
| Disconnect the Video Input A and B | Test software show the corresponding input fault. |
| Mem | Memory log Data IC status |
| Log | Storage Log Data IC status |
| Sensor | Power sensor IC status |
| Power | Current sensor IC Status |
| Temp | Temp IC status |
| PWMO | Light Dimmer IC status |
| PWMA | NA |
| Key | Key IC status |
| V out | Video Output channel IC Status |
| OSD | OSD IC status |
| RS422 | RS422 IC status |
| Host | Host IC status |

System Bit Test

## 3.18 Degraded or Emergency operation mode Test

Connect the VDU B3\_LCD display to SDI camera or Signal generator.

Select the video generator 1427 select Raster, detail, select colour, make sure that the selected colour on the LCD display.

Disconnect the input video source from the camera VDUB3 sent alert information to the VDU LCD display the screen change to blue screen, no freeze of past images.

* + - Power on the system and all the connections should be established.
    - Remove the input video source (A and B) from the VDUB3.
    - Record the result.

| Test Input | Expected Result |
| --- | --- |
| Disconnect the input video source from the camera | No signal in “Blue” screen on the LCD display panel. |

# 4.0 Visual Inspection & Documentation

| Objective | Expected Result |
| --- | --- |
| Label Tag Plate and placement (Software & Hardware revision) | Label Tag plate and placement on the E Box. According to drawing revision. |
| Connector Keyway orientation | Connector J1 & J2 on VDU B2 12 O’ clock according to the drawing. |
| Documentation | Ensure the ESS Vibration, Temperature reports indicate pass with same serial number tested by ATP. |

**VDUB3 Test Record Cover sheet**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **VDUB3 box Serial Number:** |  | | **Test Date:** |  |
|  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/W FW Version:** | **1.0.1** | **HW Version:** |  | **HW Label Tag:** | **A** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Conducted by:** | |  | **Coy:** |  | **Signature:** |  |
| **Witnessed by:** |  | | **Coy:** |  | **Signature:** |  |
| **Approved by:** |  | | **Coy:** |  | **Signature:** |  |
|  |  | |  |  | **Date:** |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/No** | **Description of Test** | **Refer to Procedure** | **Results** | | **Remarks** |
| **Pass** | **Fail** |
| **1** | **Measure the external dimension (W x H x D)** | **3.1** |  |  |  |
| **Measure the mass of the Box** |  |  |  |
| **Mounting Dimension** |  |  |  |
| **2** | **Operating Power** | **3.2** |  |  |  |
| **3** | **System Start up time** | **3.3** |  |  |  |
| **4** | **Reverse polarity test** | **3.4** |  |  |  |
| **5** | **Video latency test** | **3.5** |  |  |  |
| **6** | **Video IO characteristics** | **3.6** |  |  |  |
| **7** | **Video Flickering Test** | **3.7** |  |  |  |
| **8** | **Video Smearing test** | **3.8** |  |  |  |
| **9** | **LCD defects** | **3.9** |  |  |  |
| **10** | **Display resolution test** | **3.10** |  |  |  |
| **11** | **Display contrast test** | **3.11** |  |  |  |
| **12** | **Display Brightness test** | **3.12** |  |  |  |
| **12** | **VDU IO operation Test** | **3.13** |  |  |  |
| **13** | **RS422 Control Test** | **3.14** |  |  |  |
| **14** | **RS232 Debugging port Test** | **3.15** |  |  |  |
| **15** | **Ethernet Connection test** | **3.16** |  |  |  |
| **16** | **System BIT Test** | **3.17** |  |  |  |
| **17** | **Emergency Operation Mode test** | **3.18** |  |  |  |
| **18** | **Visual Inspection & Documentation** | **4.0** |  |  |  |