

C3 Colour Display

Validation Test Plan and Result Summary

EXAMINATION OR TEST	TEST SPEC	TEST SECTION	VALIDATION TEST SCHEDULE & RESULT SUMMARY							TEST LOCATION
			GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	PASS	FAIL	
ACCEPTANCE TEST	Functional Spec.	Functional Spec.	SSN10A SN02 SN22++ SN23++	SN03 SN04	SN05 SN06++	SN07A*** SN08A*** SN09A*** SSN09A** *	SN11++ SN12++ SN14B	X		VEM, Sarasota, FL, USA
VIBRATION, SWEPT SINE, CAB MOUNT	SAE J-1810	Para. 5.5	SSN10A SN22++	-	-	-	-	X X		Indication Instruments, India (See Note 9)
VIBRATION, SWEPT SINE, ENGINE MOUNT	SAE J-1810	Para. 5.5	SN02 SN23++	-	-	-	-	X X		Indication Instruments, India (See Findings Note 1)
MECHANICAL SHOCK	Functional Spec.	Para. 3.2.13	SSN10A SN02 SN22++ SN23++	-	-	-	-	X X X X		Indication Instruments, India (See Note 8)
STORAGE TEMPERATURE (24 hours at each temperature extreme. Must function after test.)	Functional Spec. -30 to +80 C	Para. 3.2.2	-	-	SN05 SN06++	-	-	X X		VEM, Sarasota, FL, USA
OPERATING TEMPERATURE (2 hour soak at each temperature extreme and test for function.)	Functional Spec. -20 to 70 C	Para. 3.2.1	-	-	SN05 SN06++	-	-	X X		VEM, Sarasota, FL, USA
THERMAL SHOCK (two hour soak at each temperature with thirty minute ramps between temperatures. 20 full cycles.)	Functional Spec. -30 to + 80 C	Para. 3.2.3	-	-	SN05 SN06++	-	-	X X		VEM, Sarasota, FL, USA
HUMIDITY (Must function after test and no signs of water intrusion into unit under test.)	ABYC P-24	Para. 24.7.4	-	SN03	-	-	-	X		VEM, Sarasota, FL, USA
SALT FOG (Unit to be functional after test)	ASTM B117	300 Hrs	-	SN04	-	-	-	X		Indication Instruments, India (See Findings Note 2 at end of this report.)

LENS FOGGING (Lens must be readable. Small droplets permitted.)	SAE J-1810	Para. 5.6.1	-	SN03 SN04 SN05	-	-	-	X X X		VEM, Sarasota, FL, USA
IGNITION PROTECTION	USCG ABYC	-	-	-	-	-	SN11++, SN12++	X X		Imanna Laboratory, Inc., Rockledge, Florida 32955 Test units are maintained at Imanna Laboratory, Inc.
OPERATING VOLTAGE	Functional Spec.	Para. 2.2	-	-	-	SSN09A** *	-	X		VEM, Sarasota, FL, USA
ELECTROMAGNETIC EMISSION										
Conducted Emissions	EN 60945	Para. 9.2, Table 5	-	-	-	SN07A*** SN08A***	-	X		Indication Instruments, India
Radiated Emissions	EN 60945	Para. 9.3, Table 5	-	-	-	SN07A*** SN08A***	-	X		Indication Instruments, India
EMC (CLASS C, REGION III)	J1113/1	-								
Radiated Immunity, 220MHz to 1GHz, 55V/m	J1113/21	-	-	-	-	SN07A*** SN08A***	-	X		Indication Instruments, India
Radiated Immunity, 1.5KHz to 220MHz, 55V/M	J1113/25	-	-	-	-	SN07A*** SN08A***	-	X		Indication Instruments, India
Near Field Radiated Emissions, 150KHz to 50MHz, Class 2	J1113/41	-	-	-	-	SN07A*** SN08A***	-	X		Indication Instruments, India
Conducted Emissions, 150KHz to 108MHz, Class 3	J1113/41	-	-	-	-	SN07A*** SN08A***	-	X		Indication Instruments, India
IMMUNITY to CONDUCTED TRANSIENTS on POWER LEADS										
Sudden Interruption of a Series Circuit, 24V System, -450V	J1113/11	Test Pulse 1	-	-	-	SN09A***	-	X		Indication Instruments, India
Transients of DC Motors Acting as Generators, 24V System, +75V	J1113/11	Test Pulse 2a	-	-	-	SN09A***	-	X		Indication Instruments, India
Switching Spikes, 24V systems, - 200V	J1113/11	Test Pulse 3a	-	-	-	SN09A***	-	X		Indication Instruments, India
Switching Spikes, 24V Systems, +2000V.	J1113/11	Test Pulse 3b	-	-	-	SN09A***	-	X		Indication Instruments, India

Load Dump, 24V Systems, 174V	J1113/11	Test Pulse 5A	-	-	-	SN09A***	-	X		Indication Instruments, India
WATER RESISTANCE	IEC 60529	IP67	-	-	-	-	SN14B	X		VEM, Sarasota, FL, USA
CHEMICAL RESISTANCE	Functional Spec.	Para. 2.4.10	-	-	-	-	Cover & Lens Assy.(s)	X		VEM, Sarasota, FL, USA By Catalog Search & Actual Test. (See Findings Note 3)
ULTRAVIOLET EXPOSURE	J2020	1000 Hrs	-	-	-	-	-	X		VEM, Sarasota, FL, USA By Catalog Search (See Attached Data / in Group 5)
ACCEPTANCE TEST	Functional Spec.	Functional Spec.	SN10A SN02 SN22++ SN23++	SN03, SN04	SN05 SN06++	SN07A*** SN08A*** SN09A*** SSN09A** *	SN11++ SN12++ SN14B	X		VEM, Sarasota, FL, USA

Notes:

- * = All tests shall be performed in the order presented.
- *** = Samples with new electronics that allow use at from 10 to 32 Vdc.
- ++ = These units contain new production processor PWA with proper length pins.
- During Shock and Vibration testing, the control accelerometer shall be positioned on the test block adjacent to the unit under test. All wire leads shall be secured to the test fixture at a distance of 6 inches from the wire egress from the UUT. Please send photo of test block prior to starting the test program. UUT should be operational during vibration and monitored for LCD intermittent operation.
- Two extra units, SSN09A and SSN10A, are being provided for use as required during EMC testing and set-up.
- VEM will supply harnesses for vibration and EMC testing.
- Except for Group #4, all testing shall be conducted at 12 to 14 Vdc.
- Mechanical Shock Functional Spec - Subject the unit to three half sine 10±1g shocks of 12 ms±1ms duration in the vertical, lateral and the unit shall be tested for basic operation i.e. power up and serial communication is operational. After testing, the unit shall complete a full operational test and exhibit no damage.
- SAE J1810 Cab Mount Vibration Test - 44g half sine of 9-13 ms duration

Finding Notes:

- During the first three hours of Engine Mount vibration, it was reported that “noise observed from inside unit”. Test continued for full six hours plus two additional hours. Unit remained operational during and after test. Post test examination revealed that the two MOV(s) departed the PWA. Issue was not noted on the remaining three units. No reports of this condition have been reported from field applications. Condition can be corrected by the addition of RTV or Cellular foam pads to dampen the effects of vibration. These additions will be considered if we see any field applications. The MOV(s) are only functional to protect the unit(s) from excessive voltage over loads.
- This unit was assembled using steel and stainless steel screws in order to verify if the black coating would stand up to 300 hours of salt fog testing. After 300 Hours of testing the steel screw showed heavy red rust on and around the head of the screw. The four black coated stainless steel screws retaining the cover showed no signs of corrosion. As a result of this testing, all screws used in the assembly of this device are specified as stainless steel with a black coating. Operation after test was normal except for the LCD Screen exhibited a yellow hue which is a connection issue found with the early LCD(s).

3. Actual chemical testing was done on Lens and Cover assemblies. All of the listed chemicals were tested in accordance with the Functional Specification except for NaOH mixture. This chemical was not tested as it is highly caustic and is no longer readily available to the end user. The UUT passed exposure to all of the other chemicals, when tested per the specification. Exposure to Acetone did soften and mar the surface of the cover. The Lens was not affected by the exposure to the Acetone. See photograph in TR-12-0017 located within this document binder.