

SIGNAL DIRECTORATE
 RESEARCH DESIGN & STANDARDS ORGNIZATION
 LUCKNOW - 226011

Firm's Name:
 Sl. No. of Sample:

S. No	Name of Test	Clause No.	Parameter	Specified value	Observed value	OK/ Not OK
1.	Visual inspection, and Dimensional check.	Cl. 1.4	System design	<p>Type I - The system shall be modular by design and shall have 8 cards with monitoring arrangement of 4 fuses in one card. capacity for monitoring 32 nos. of external Non Deteriorating Type or 'G' type fuses from 0.6 Amp to 4 Amp</p> <p>Type II - The system shall be modular by design and shall have 6 cards with monitoring arrangement of 4 fuses in one card. capacity for monitoring 24 nos. of external Non Deteriorating Type or 'G' type fuses from 4 Amp to 10 Amp</p>		
		Cl. 1.4.1	Power Supply	All fuses are being monitored by one card of same supply having common ground and it is possible to combine more such card or boxes for monitoring more no. of fuses.		
		Cl. 1.7	Standby fuses	<p>Type I- Standby fuse size 5X20 mm ceramic tube type with high breaking capacity (1500 Amp) & 250 V rating as per IEC 60127-2</p> <p>Type II- Standby fuse size 6.35X32 mm ceramic tube type with high breaking capacity (1500 Amp) & 250 V rating as per IEC 60127-2 Make of fuses Cooper Bussman, Protectron, Shurter etc. certified UL, TUV etc.</p>		
		Cl. 4.1	Module size	<p>Suitable for easily fitted in 19 inch rack. Depth should be ≤ 165 mm. The maximum height is 4U(7")*.</p> <p>*Note: U commonly known as unit and equal to 1.75"(44.45 mm) 2 nos. of extender plates of 1.5mm thickness with suitable fixing holes are provided.(If specifically asked by purchaser that FACS module is to be installed in existing relay racks).</p>		
		Cl 4.2	Housing thickness	Steel sheet thickness ≥ 1 mm		
		Cl 4.3	Housing finishing	Powder coating on housing.		
				Small metal parts such as nuts, bolts and washers shall be chrome plated.		
		Cl. 4.4	Wiring used	Layout of the component/wiring to be such that inspection/repair is easily accessible.		
		Cl. 4.4	Wiring used	Only copper wire used & it conforming to IRS:S 76/89 or IS: 694 of grading 1100 volts.		
		Cl. 4.5	safety	AC input portion shall be protected to prevent accidental contacts.		
Cl. 4.6	Components on the Power card module	<ul style="list-style-type: none"> i. POWER ON Indication (LED based). ii. Buzzer ACKNOWLEDGE push button. iii. Fuse for protection of Power card module. iv. TEST push button for checking health of all indications. v. Buzzer 				

S.No.	Name of test	Clause no.		Parameter	Specified value	Observed value	OK/ Not OK
1.	Visual inspection, and Dimensional check.	Cl. 4.7	i to iii	Components on the monitoring card module	Following components shall be provided on each monitoring card of the system:		
					<ol style="list-style-type: none"> 1. Standby Fuses. 2. LED indications for Main and Standby Fuses monitored by the card. 3. RESET push button (one for each monitoring card) 		
		Cl 5.1	5.1.2	Components and PCB used in design of system (Shall conform to clause 5.1 and 5.2 of RDSO/SPN/144/2006)	(a) ICs and other components used in the equipment shall be of such grade that these can work satisfactorily in -40 deg to +85 deg C temperature range. (To be verified from invoice /data sheet)		
					(b) Capacitors used should be certified for at least +105 deg. C. (To be verified from invoice /data sheet)		
					(c) Discrete components like diodes, transistors, SCRs etc. should conform to industrial grade. (To be verified from invoice /data sheet)		
					(d) PCB should be FR4 or better. (To be verified from invoice & /data sheet)		
					(e) The box should be metallic.		
5.1.3	Make and diameter of indication LEDs in system	Nichia, Avago, Osram, Cree or Kwality (India) make of 3 mm dia. (To be verified from invoice /data sheet)					
5.1.4	Wiring & Soldering	No extra wires other than secondary fuse connections shall be used for interconnection of components on the PC cards. Soldering of components shall be neatly done.					

S.No.	Name of test	Clause no.	Parameter	Specified value	Observed value	OK/ Not OK
1.	Visual inspection and Dimensional check.	Cl. 5.1.5	Coating on the Printed circuit cards	All PC cards shall be coated with transparent epoxy paint/ Acrylic conformal coating after mounting & soldering of the components.		
		Cl. 5.1.6	Indication LED	All Indication LEDs shall be mounted on PCBs and shall not be loose wired.		
		Cl. 5.2.1	Switches and push button	The switches and push buttons used shall be of high quality and performance. These shall be able to withstand >50000 operations. Switches shall be robust in structure and shall be able to withstand jerks. (to be verified from data sheet)		
		Cl. 5.2.2	Wiring termination	All wiring from Relay racks to the system cabinet must be terminated on connectors soldered directly on the cards or motherboard PCB		
		Cl. 5.2.3	Current terminals	The current carrying terminals shall be of copper or brass and shall be plated for protection against corrosion.		
		Cl. 6.4	Ventilation	Natural ventilation should be provided for power supply modules inside the equipment.		
		Cl. 7.1	Marking	The markings shall be placed in the vicinity of the components and shall not placed on removable parts.		
		Cl. 7.2	Marking on Input and other Terminals	Input terminal, supply,ground and fuse input labels shall be clearly marked on monitoring card as well supply voltage should be clearly mentioned nearby at the input terminals.		
		Cl. 7.3 & 7.5	Marking	All markings shall be easily legible.		
				Metallic labels firmly fixed and not easily removed by hand.		
				Durability of marking shall be checked before and after climatic test.		
				Words 'Indian Railway Property' in letter of 5 mm size (min) engraved/embossed/screen printed		
		Cl. 7.4	Marking on name plate/Screen printing on the Unit	Manufacturer name or trademark		
				Serial number of the unit		
				RDSO's specification number		
Operating voltage						
Month and year of manufacture						

S.No.	Name of test	Clause no.	Parameter	Specified value	Observed value	OK/ Not OK
2.	Operating Parameters	Cl. 1.2	Changeover facility	Changeover facility from main fuse to spare fuse should be automatically when main fuse is blown off.		
				No effect on the functioning of signaling circuit.		
				Audio/Visual indication appearance at every changeover.		
		Cl. 1.5	Monitoring fuses	The system shall be capable of monitoring fuses with system voltage of fuse circuit as 12V, 24V, 60V or 110V DC/AC upto 0.6A to 4A in Type I and 4A to 10A in Type II of FACS		
		Cl. 1.6	Optocoupler	to be used for isolation in input for every fuse.		
		Cl. 1.8	Standby fuse	Standby fuse shall come in circuit only after blowing of the main fuse and should be out of circuit when RESET switch is pressed after replacement of main fuse.		
		Cl 4.8	Monitoring current	The current drawn for the monitoring the status of fuse shall not be more than 3 mA for each fuse at following system voltage of fuse circuit.		
				12V DC		
				24V DC		
				60V DC		
110V DC						
		110V AC				

S.No.	Name of test	Clause no.	Parameter	Specified value	Observed value	OK/ Not OK	
2.	Functional & operating parameters tests.	Cl. 6.1	System design	The system design shall be such that failure of any component should not interrupt the supply to load by any means. For monitoring the fuses, wires shall be taken from respective fuses. In each set, a Green LED shall glow for healthy Main fuse & and a separate one for healthy Standby fuse. Similarly, separate Red LEDs shall indicate failure of Main fuse & Standby fuse.			
		Cl. 6.2	Changeover to standby fuse in case of main fuse failure	The main fuse supply should be disconnected using a switch, the Load should automatically switch to standby fuse. Relay changeover time Should be less than 20 m seconds.			
		Cl. 6.3	Presence of MAIN fuse in circuit on startup and normal condition.	Before start main and standby fuses should be intact When system starts only MAIN Fuse should be in circuit and standby fuse should not be in circuit.			
		Cl. 6.5	Test PUSH Button	Pressing PUSH Button make- all indication LEDs GLOW simultaneously.			
		Cl. 6.6	Potential Free Contacts	Six numbers PFC contact should be there and should be in normally MAKE condition. There should be no potential on contacts.			
		Cl. 6.7 & 6.8	On Failure of MAIN Fuse:	LED indications	The LED indication for particular main fuse changes from GREEN to RED.		
				Audio Alarm(Buzzer)	Buzzer should give audio Alarm.		
				Potential Free Contacts	Potential free contact assigned to MAIN fuse should break out. check using multi meter there should not be any continuity.		
				Alarm Acknowledgement	Pressing of the 'Acknowledge' button on the unit shall cut off the alarm but the LED indication shall remain till the fuse is replaced.		
			On Failure of Standby Fuse:	LED indications	The LED indication for particular Standby fuse changes from GREEN to RED.		
				Audio Alarm(Buzzer)	Buzzer should give audio Alarm.		
				Potential Free Contacts	Potential free contact assigned to standby fuse should break out check using multi meter there should not be any continuity.		
				Alarm Acknowledgement	Pressing of the 'Acknowledge' button on the unit shall cut off the alarm but the LED indication shall remain till the fuse is replaced.		

S.No.	Name of test	Clause no.	Parameter	Specified value	Observed value	OK/ Not OK		
2.	Operating parameters tests.	Cl. 6.9 & 6.10	a.	Indication LEDs and Audible alarm	The LED should light up till the fault persists and audible alarm shall only be reset. The visual indication should disappear when the fuse is replaced and RESET button is pressed. However, if another fuse is blown off after resetting / muting the buzzer, the audible buzzer should come again along with the visible indication			
			b.	Fuse Holder on panel for Standby Fuses	(a) Standby fuse shall be mounted in a screw type fuse holder of panel mount type. (b)The fuse holder shall be from reputed UL/UR/CSA/CE approved manufacturers.(check data sheet) (c) The body of the fuse holder shall be UL-94 V-0 Thermoplastic.(check data sheet) (d)The contacts shall be tinned copper with < 5milli ohm contact. (To be verified from data sheet)			
			c.	Buzzer for Audible Alarm	Should have dual tone intermittent sound.(3-5 KHz)			
		Cl 6.11		Relay used	Shall be OEN/PLA/OMRON/GOODSKY make			
		Cl 6.12		Operation wiring	The system should operate on N+2 wire where N is the Number of fuses.			
		Cl 6.13		No. of fuses	The system should be able to monitor 12V,24V,60V, 110VAC/DC in block of 4 fuses on one card of each voltage.			
		Comm on Audio Visual Alarm Unit	Cl 6.14	i.	Power supply OK Indication	Yellow (5 mm) LED should be glowing for POWER ON.		
	ii.		LED indication (RED)/5mm for main Fuse	Shall be blinking in case of any main fuse getting blown				
	iii.		LED indication (RED)/5mm for Standby Fuse	It Shall be blinking if any of the standby fuse also is blown along with its Main fuse. Both the LEDs shall be lit in case of both Main and Standby getting blown.				
	iv.		Audio Alarm	Piezoelectric buzzer should give audio alarm for fuse failure				
	v.		Acknowledge Button (shall be non locking type push button)	On pressing shall cut the Audio Alarm but indications keep blinking till fault Persists.				
	GSM Modem (optional)	Cl. 6.15	i.	Mobile number and Station Code Configuration in GSM module if to be supplied with the system.	Mobile number and Station Code should be Configurable as specified in user manual of manufacturer & it should update list of Users & Station Code through SMS after configuration.			
			ii.	Message Sending < 30 Sec.	For main Fuse Blown	SMS in Prescribed Formats for all these Events should be received on five Mobile numbers configured earlier along with the configured Station Code.		
			iii.		For Standby Fuse Blown	SMS in Prescribed Formats for all these Events should be received on five Mobile numbers configured earlier along with the configured Station Code.		
iv.				For Fuse replaced & restored	SMS in Prescribed Formats for all these Events should be received on five Mobile numbers configured earlier along with the configured Station Code.			

2.	Operating Parameters	6.16	i	Make and Compatibility of GSM Modem	The Operating voltage of GSM modem shall be 110V AC with adopter from reputed make and compatible to Tri or Quad-band GSM 850, 900, 1800 and 1900 MHz. It shall support GPRS class 10 or better. (To be verified from invoice /data sheet)	
			ii.	Operating Temperature of Modem	It shall be able to withstand operating temperature upto 70° C and humidity upto 95%. (To be verified from invoice /data sheet)	
			iii.	SMS Format to be sent	Main fuse blown standby operate	ATTENTION: FUSE BLOWN AT STATION XXXX STANDBY OPERATIVE
					Main And Standby Both Fuse Blown	ATTENTION: BOTH FUSES BLOWN AT STATION XXXX
Replace fuse press reset button;	“FUSE REPLACED AT STATION XXXX”					

3. Climatic tests :

3.1 Change of temperature test (as per IS-9000/ Part XIV sec-2):

Description of the test		Remarks
Low temp.	- 10°C ±3 °C	
High temp.	+ 70°C ±2 °C	
Rate of change of temp.	1°C / min.	
Duration	7 hrs. at each temp.	
Cycle	3	
Condition	The equipment shall be kept energized during the test.	
Recovery	After completion of the test, the equipment shall be subjected for standard recovery (15 to 35°C, RH 45 – 75 %) of 2 hours.	
Observations	After recovery, the equipment shall be checked visually for any damage. The equipment shall be completely operational and functional.	
Insulation Resistance	Shall not be less than 10 Mega ohm.	

3.2 Dry heat test (as per IS-9000 Part III sec. 3):

Description of the test		Remarks
Temperature	+ 70°C	
Duration	16 hrs.	
Condition	The equipment shall be kept energized	
Recovery	After completion of the test, the equipment shall be subjected for standard recovery (15 to 35°C, RH 45 – 75 %) of 2 hours.	
Observations	After recovery, the equipment shall be checked visually for any apparent damage & deterioration. The equipment shall be completely operational and functional.	
Insulation Resistance	Shall not be less than 10 Mega ohm.	

3.3 Cold test (as per IS-9000 Part II sec. 3):

Description of the test		Remarks
Temperature	- 10°C ±3 °C	
Duration	2 hrs.	
Condition	The equipment shall be kept energized during the test.	
Recovery	After completion of the test, the equipment shall be subjected for standard recovery (15 to 35°C, RH 45 – 75 %) of 2 hours.	
Observations	After recovery, the equipment shall be checked visually for any apparent damage & deterioration. The equipment shall be completely operational and functional.	
Insulation Resistance	Shall not be less than 10 Mega ohm.	

3.4 Cyclic damp heat test (as per IS-9000 Part V sec. 2, Variant I):

Description of the test		Remarks
Temperature	Upper=40 °C Lower=25 °C	
Humidity	95 % (+1%, - 5%).	
Cycle	6	
Condition	The equipment shall be kept energized during the test.	
Recovery	After completion of the test, the equipment shall be subjected for standard recovery (15 to 35°C, RH 45 – 75 %) of 2 hours.	
Observations	After recovery, the equipment shall be checked visually for any apparent damage & deterioration. The equipment shall be completely operational and functional.	
Insulation Resistance	Shall not be less than 10 Mega ohm.	

3.5 Steady state damp heat test (as per IS-9000 Part IV)

Description of the test		Remarks
Temperature	40°C ±2 °C	
Humidity	93 % (+2%, - 3%).	
Duration	4 days	
Condition	The equipment shall be kept energized during the test.	
Recovery	After completion of the test, the equipment shall be subjected for standard recovery (15 to 35°C, RH 45 – 75 %) of 2 hours.	
Observations	After recovery, the equipment shall be checked visually for any apparent damage & deterioration. The equipment shall be completely operational and functional.	
Insulation Resistance	Shall not be less than 10 Mega ohm.	

3.6 Salt mist test (as per IS-9000 Part XI procedure 3)

Description of the test		Remarks
Temperature	35°C ±3 °C	
Humidity	93 % (+2%, - 3%).	
Mist + Damp heat	2 hrs. + 22 hrs.	
Cycle	3	
Condition	The item shall be exposed for 2 hrs. in salt laden atmosphere in the chamber. At the end of the test, the item shall be transferred to a damp heat chamber maintained at the above temperature & humidity for 22 hrs. The equipment shall be kept de-energized during the test. This is one cycle. Total 3 cycles shall be done.	
Recovery	After completion of the test, the equipment shall be subjected for standard recovery (15 to 35°C, RH 45 – 75 %) of 2 hours.	
Observations	After recovery, the equipment shall be checked visually for any apparent damage & deterioration. The equipment shall be completely operational and functional.	
Insulation Resistance	Shall not be less than 10 Mega ohm.	

3.7 Dust Test (as per IS 9000 Part XII):

Description of the test		Remarks
Duration	1 hour.	
Condition	The item shall be subjected in the chamber at laboratory temperature in switched off condition. The temp. of the chamber shall then be raised to a value of 40°C ±3 °C with a relative humidity not exceeding 50%, shall be maintained in the chamber. When the temp. stability has been attained; the test item shall then be subjected to a stream of dust – laden air for a period of one hour.	
Recovery	After completion of the test, the equipment shall be subjected for standard recovery of 2 hours.	
Observations	After recovery, the equipment shall be checked visually for any deterioration.	
Insulation Resistance	Shall not be less than 10 Mega ohm.	

3.8 Bump test (IS 9000 Part VII, Sec. 2)

Description of the test		Remarks
No. of bumps.	1000	
Peak acceleration	400m/sec ² g.	
Pulse duration	6 ms.	
Number of axis	3	
Condition	PCBs/Modules/units in packed condition shall be subjected to bump test as under:	
Observations	After this test, the equipment shall be checked visually for any apparent damage & deterioration. The equipment shall be completely operational and functional.	

3.9 Vibration test (as per IS: 9001Part XIII)

Description of the test		Remarks
Frequency range	5 – 350 Hz	
Amplitude	±6mm constant displacement or 15 m/s ² constant acceleration	
No of axes	3	
No. of sweep cycle	20	
Total duration for the 20 sweep cycles.	1 hour 45 minutes	
If resonance is observed	10 min at each resonant frequency	
Observations	Equipment shall be visually examined for any apparent damage. After completion of the test the equipment shall be tested for its normal operation.	

3.10 Environmental Stress Screening tests (ESS) for Printed Circuit Boards (PCB) & sub system:

The manufacturer shall carry out the ESS test on all modules on 100% basis during production/testing as per S. No. 13 of Clause No. 9.3 of Specification RDSO/SPN/144/2006. Suitable records shall be maintained/provided regarding the compliance of the test.

4. Fail Safety test: The equipment design shall be such that any short/open or any other defect in any of the component will not lead to unsafe/undesirable situation.

S.No.	Name of test	Clause no.	Parameter	Procedure of Testing	Specified Value	Observed value	OK/ Not OK
5.	Applied High Voltage Test	Cl. 8.3	Effect of Applied High voltage 2000 Volts rms, sine wave with frequency 50-100 Hz. If body is being used as heat sink, the test voltage is 1500 Vrms	A test Voltage of 2000Volts rms is applied between the body and the input terminals of supply .	The equipment shall withstand for one minute without puncture & arcing		
				A test Voltage of 2000Volts rms is applied between the body and the fuse sensing terminals	The equipment shall withstand for one minute without puncture & arcing		
6.	Insulation Resistance Test	Cl. 8.4	Insulation Resistance	The Insulation Resistance shall be measured between the body and the fuse sensing terminals and supply terminals looped together at a potential of 500 V DC before & after HV test.	Greater than 100 Mega Ohms at 40°C & 60% RH before HV test		
					Greater than 100 Mega Ohms at 40°C & 60% RH after HV test		

S. No.	Name of test	Clause no.	Parameter	Input Voltage	Specified Value	Observed value	OK/ Not OK
7.	Power Supply range	Cl. 1.3	The FACS System should work satisfactorily either on 24V or 60V DC or 110V AC as specified in the purchase order +20% and -30%.	16.8-28.8Volts DC	Shall work normally		
				42-72 Volts DC	Shall work normally		
				77-132 Volts AC	Shall work normally		
			Over load protection voltage	For 24 V, 60V DC & 110V AC	To be provided for proper working of system.		
			Reverse voltage protection	For 24 V and 60V DC	The system should not fail		