ANNEX I

ELECTRONICS REGIONAL TEST LABORATORY (WEST) MINISTRY OF INFORMATION TECHNOLOGY (STQC Dte.)	REPORT NO. ERTL(W) / 2000E&S139		
SUBJECT: TESTING OF DIGITAL MULTIMETER	DATE 11 OCT 2000	PAGE 1	OF 9

1. **SCOPE**

1.1 Service Request No : ERTL(W) / 20001459 DT.04-SEP-2000

1.1.1 Service Request finalised on : 04-SEP-2000

1.2 Requested by
(Name and address of organisation) : RISHABH INSTRUMENTS P.LTD.
F-31,MIDC,SATPUR,
NASIK,

1.3	Item No.	Description	Qty	Manufacturer and Type * No.	Serial Nos.
	1.	ELECTRONIC MEASURING INSTRUMENTS DIGITAL MULTIMETER	01	RISHABH INSTRUMENTS Model : 13 S	990748

1.4 Test specifications : As per IS 13875 (Part- II) - 1993

1.5 Lab Ambient Temperature : (25 ± 2) deg.C
Humidity : (55 ± 5) % RH

1.6 Test Equipment used :

1) W/I Auto Tester	E&S//066
2) Calibration System	S&C/138
3) IR tester	COM/027

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2.0 Test Results :

2.1 Initial Accuracy test :

Sr. No	Parameter / Range	Test Condition	Allowed error in +/- digits	Observed error in digits	Remark
	DC Voltage	Input to UUT			
1	30.0 mV	3.0 mV	5	+ 3	Complied
2		15.0 mV	11	+3	- do -
3		27.0 mV	17	+ 3	- do -
4	300.0 mV	30.0 mV	5	+1	- do -
5		150.0 mV	11	0	- do -
6		270.0 mV	17	+ 1	- do -
7	3.0 V	.30 V	2	0	- do -
8		1.50 V	5	+ 1	- do -
9		2.70 V	8	-1	- do -
10	30.0 V	3.0 V	2	- 1	- do -
11		15.0 V	5	-2	- do -
12		27.0 V	8	-3	- do -
13	300.0 V	30.0 V	2	-1	- do -
14		150.0 V	5	-1	- do -
15		270.0 V	8	-3	- do -
16	1000 V	100.0 V	1	-1	- do -
17		500.0 V	3	-1	- do -
18		900.0 V	4	-2	- do -
	AC Voltage (at 50 Hz)				
19	3.0 V	.30 V	4	+ 2	- do -
20		1.50 V	13	- 3	- do -
21		2.70 V	22	- 3	- do -
22	30.0 V	3.0 V	4	- 1	- do -
23		15.0 V	13	- 2	- do -
24		27.0 V	22	- 3	- do -
25	300.0 V	30.0 V	4	0	- do -
26		150.0 V	13	+ 1	- do -
27		270.0 V	22	- 2	- do -
28	1000 V	100.0 V	3	0	- do -
29		500.0 V	6	0	- do -
30		900.0 V	9	+ 1	- do -
	AC Current (at 50 Hz)				
31	30.0 mA	3.0 mA	7	- 3	- do -
32		15.0 mA	25	-3	- do -
33		27.0 mA	43	-7	- do -
34	300.0 mA	30.0 mA	7	-2	- do -
35		150.0 mA	25	+ 3	- do -
36		270.0 mA	43	+5	- do -
37	16.0 A	1.6 A	4	-2	- do -
38		8.0 A	14	+ 5	- do -
39		14.4 A	24	+ 5	- do -

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2.0 Test Results :

Sr. No	Parameter / Range	Test Condition	Allowed error in +/- digits	Observed error in digits	Remark
	DC Current				
40	3.00 mA	0.30 mA	8	+ 2	Complied
41		1.50 mA	20	+ 5	- do -
42		2.70 mA	32	+ 2	- do -
43	30.0 mA	3.0 mA	3	0	- do -
44		15.0 mA	6	- 2	- do -
45		27.0 mA	9	- 3	- do -
46	300.0 mA	30.0 mA	5	- 2	- do -
47		150.0 mA	17	+ 3	- do -
48		270.0 mA	29	+ 4	- do -
49	3.0 A	0.30 A	8	- 3	- do -
50		1.50 A	20	- 5	- do -
51		2.70 A	32	- 4	- do -
52	16.0 A	1.6 A	4	+ 1	- do -
53		8.0 A	10	+ 2	- do -
54		14.4 A	16	+ 6	- do -
	Resistance				
55	30.00 ohm	3.0 ohm	5	+ 3	- do -
56		15.0 ohm	11	+ 2	- do -
57		27.0 ohm	17	+ 2	- do -
58	300.0 ohm	30.0 ohm	5	0	- do -
59		150.0 ohm	11	- 2	- do -
60		270.0 ohm	17	- 4	- do -
61	3.0 kohm	.3 k ohm	2	+ 1	- do -
62		1.5 k ohm	7	+ 3	- do -
63		2.7 k ohm	12	+ 3	- do -
64	30.0 kohm	3.0 k ohm	2	+ 1	- do -
65		15.0 k ohm	7	0	- do -
66		27.0 k ohm	12	- 3	- do -
67	300 kohm	30.0 k ohm	2	- 1	- do -
68		150.0 k ohm	7	- 3	- do -
69		270.0 k ohm	12	- 5	- do -
70	3.0 Mohm	.3 Mohm	3	+ 2	- do -
71		1.5 Mohm	10	+ 1	- do -
72		2.7 Mohm	17	+ 3	- do -
73	30.0 Mohm	3.0 Mohm	7	0	- do -
74		15.0 Mohm	31	+ 3	- do -
75		27.0 Mohm	55	- 6	- do -
	Temperature				
76	Pt - 100	- 180 C /	25	2	- do -
77		+ 180 C /	25	3	- do -
78		+ 400 C /	45	3	- do -
79		+ 600 C/	65	+ 7	- do -

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2.2. Influence Effect resulting from Interference test :

Sr. No	Parameter / Range	Test Condition	Requirement	Observation	Remark
2.2.1	Normal mode Rejection	Interference signal of 1000 V / 50 Hz shall be applied in the lowest DC voltage range Note down observed influence on the DC V / 30 mV range of UUT.	Normal mode rejection shall be more than 50 dB	100.4 dB	Complied
2.2.2	Normal mode Rejection	Interference signal of 1000 V DC shall be applied in the lowest AC voltage range . Note down observed influence on the AC V / 3.0 V range of UUT.	Normal mode rejection shall be more than 110 dB	120.0 dB	Complied

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2.0 Test Results :

Sr. No	Parameter / Range	Test Condition	Requirement	Observation	Remark
2.2.3	Common Mode Rejection	UUT kept on a metal plate, which is extended by atleast 150 mm to all sides of UUT and is at earth potential. Interference signal of 1000 V / 50 Hz connected in parallel between earth potential and ground terminal of UUT with a resistance of 1 k ohm for all AC / DC Voltage ranges. Note down observed influence on UUT	Common mode rejection shall be more than specified value.		
		DC Voltage ranges :			
1		30.0 mV	> 120 dB	138 dB	Complied
2		300.0 mV	> 120 dB	∞	-- do --
3		3.0 V	> 120 dB	∞	-- do --
4		30.0 V	> 120 dB	∞	-- do --
5		300.0 V	> 120 dB	∞	-- do --
6		1000 V	> 120 dB	∞	-- do --
		AC Voltage (at 50 Hz.)			
7		3.0 V	> 80 dB	104 dB	-- do --
8		30.0 V	> 80 dB	100 dB	-- do --
9		300.0 V	> 70 dB	∞	-- do --
10		1000 V	> 60 dB	∞	-- do --
2.2.4	Common Mode Rejection	UUT kept on a metal plate, which is extended by atleast 150 mm to all sides of UUT and is at earth potential. Interference signal of 1000 V DC connected in parallel between earth potential and ground terminal of UUT with a resistance of 1 k ohm for all AC / DC Voltage ranges. Note down observed influence on UUT	Common mode rejection shall be more than specified value.		
		DC Voltage			
1		30.0 mV	> 120 dB	140 dB	Complied
2		300.0 mV	> 120 dB	∞	-- do --
3		3.0 V	> 120 dB	∞	-- do --
4		30.0 V	> 120 dB	∞	-- do --
5		300.0 V	> 120 dB	∞	-- do --
6		1000 V	> 120 dB	∞	-- do --
		AC Voltage (at 50 Hz.)			
7		3.0 V	> 80 dB	106 dB	-- do --
8		30.0 V	> 80 dB	∞	-- do --
9		300.0 V	> 70 dB	∞	-- do --
10		1000 V	> 60 dB	∞	-- do --

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2.0 Test results :

2.3 Frequency Influence error in tne case of AC measured quantity :

Sr. No	Parameter / Range	Test Condition	Requirement	Observation	Remark
	Variation of AC measured Quantity	Input to UUT is applied at reference frequency (50 Hz) in following ranges and note down observations . Then, frequency of input is varied and note down corresponding observations.	Deviation observed shall not exceed max. permissible error.		
	AC Voltage		Max. allowed error in digits	Max. error observed	
1	3.0 V	3.0 V	63	- 21	Complied
2	30.0 V	30.0 V	63	- 28	- do -
3	300.0 V	300.0 V	63	- 37	- do -
4	1000 V	1000 V	33	-9	- do -
	AC Current				
5	30.0 mA	30.0 mA	63	+ 11	- do -
6	300.0 mA	300.0 mA	63	+ 6	- do -
7	16.0 A	16.0 A	35	+ 6	- do -

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2.0 Test Results :

2.4 Step Response Time :

Sr. No	Parameter / Range	Input to UUT	Requirement	Observation	Remark
	Response Time	80 % of F.S. is applied to UUT in following ranges and then immediately after application, Value observed on UUT is noted.	Observed Value on UUT shall not deviate from the value indicated by UUT in steady state condition by more than maximum permissible error.	Following observations were made on UUT within 1 to 2 sec after application of input.	
	DC Voltage /		Allowed error in digits	Observed error in digits	
1	30.0 mV	24 mV	15	+ 4	Complied
2	300.0 mV	240 mV	15	+ 4	-- do --
3	3.0 V	2.4 V	7	- 1	-- do --
4	30.0 V	24 V	7	- 4	-- do --
5	300.0 V	240 V	7	- 3	-- do --
6	1000 V	800 V	4	+ 1	-- do --
	AC Voltage (at 50 Hz)				
7	3.0 V	2.4 V	20	- 3	-- do --
8	30.0 V	24 V	20	- 4	-- do --
9	300.0 V	240 V	20	0	-- do --
10	1000 V	800 V	8	+ 2	-- do --
	AC Current (at 50 Hz)				
11	30.0 mA	24 mA	38	+ 4	-- do --
12	300.0 mA	240 mA	38	+ 3	-- do --
13	16.0 A	12.8 A	21	- 2	-- do --
	DC Current				
14	30.0 mA	24 mA	8	+ 2	-- do --
15	300.0 mA	240 mA	26	- 4	-- do --
16	16.0 A	12.8 A	15	- 2	-- do --
	Resistance				
17	30 ohm	15 ohm	11	0	-- do --
18	300 ohm	150 ohm	11	- 3	-- do --
19	3.0 k ohm	1.5 k ohm	7	- 2	-- do --
20	30.0 k ohm	15 k ohm	7	+ 1	-- do --
21	300 k ohm	150 k ohm	7	+ 2	-- do --
22	3.0 M ohm	1.5 M ohm	10	+ 2	-- do --
23	30.0 M ohm	15 M ohm	31	+ 5	-- do --

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2.0 Test Results :

2.5 Overload Test :

2.5.1 Intrinsic error test before overload test :

Sr. no	Test / Parameter	Test condition (Input to UUT)	Requirement (Allowed error in +/- digits)	Observed error in digits	Remark
1	DC V / 1000 V	900 V	4	- 3	Complied
2	AC V / 1000 V	900 V / 50 Hz	9	+ 1	- do -
3	DC I / 16 A	14.4 A	16	- 3	- do -
4	AC A / 16 A	14.4 A / 50 Hz	24	+ 1	- do -
5	Resistance / 30 Mohm	27.0 M ohm	55	+ 2	- do -

2.5.2 Over load Test :

Sr. no	Test /Parameter	Test condition	Requirement	Observations	Remark
1.	Overload Test	Following input applied to UUT as Overload for a period of 2 hours in ranges mentioned below DC / AC V :1200 V DC / AC I : 16 A Resistance : 500 V DC Then accuracy test is carried out for these ranges.	There shall not be any damage to UUT. UUT shall remain within specified accuracy limits after overload.	No damage was observed on UUT during Overload test. For Intrinsic error test observations refer 2.5.3 below.	Complied -------

2.5.3 Intrinsic error test after overload test :

Sr. no	Test / Parameter	Test condition (Input to UUT)	Requirement (Allowed error in +/- digits)	Observed error in digits	Remark
1	DC V / 1000 V	900 V	4	- 2	Complied
2	AC V / 1000 V	900 V / 50 Hz	9	+ 3	- do -
3	DC I / 16 A	14.4 A	16	- 4	- do -
4	AC A / 16 A	14.4 A / 50 Hz	24	+ 4	- do -
5	Resistance / 30 Mohm	27.0 M ohm	55	+ 7	- do -

2.6 Self Heating due to Measured Quantity Test :

Sr. no.	Test / Parameter	Test condition	Requirement	Observations	Remark
	Self Heating	UUT kept in ON condition for 2 hours without any input. After 2 hours 90 % of F.S. applied to UUT as input for 30 minutes in following ranges and then observations are noted	Deviation shall be within specified intinsic limits.	Ovserved Deviation after 30 minutes	
1	DC V / 1000 V	900 V		+ 2	Complied
2	AC V / 1000 V	900 V / 50 Hz		+ 3	- do -
3	DC I / 16 A	14.4 A		- 4	- do -
4	AC I / 16 A	14.4 A / 50 Hz		5	- do -

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3.0 General Remarks :

3.1 Intrinsic errors indicated by the manufacturer in their manual were converted to digits as per the formulae laid down in IS 13875, vide cl. No.4.2.2

3.2 Manual supplied by manufacturer was referred alongwith reference test sheets wherever required for the execution of the tests. However, the manual did not bear any document no.

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11/10/2000

HEAD (E&S)

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