



DATA SHEETS

Company:	Acura Spa System	Engineer:	Gulzar Singh
Product:	Spa controllers, spa side controller and blower	Tested By:	GS
Model No:	MT, ST, CHL, HL, PS, QS, PM	Project Number:	3096347-108
Sample condition:	Production		
Standards:	UL 1563 5 th Ed, Issued 03/08/04, Rev 02/10/06		

TEST PERFORMED	PARAGRAPH	PASS	FAIL
Leakage current test	41	P	
Available current test	42	P	
Insulation resistance test	43	P	
Leakage current test after Humidity conditioning test	46	P	
Dielectric test	47	P	
Leakage current in water	53	P	
Strain relief test	58	P	

Model MT with two heaters, 3 motor pumps and option of 1 ozone and circulation pump was considered representative of all models/series

Tested By: Gulzar Singh	Initials: <input type="text"/>
Reviewed By: Daniel Woodcock	Initials: <input type="text"/>

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TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Equipment No.	Cal. Due Date
1	Humidity Chamber	Tenney	VERSA TEN IV	000259	02/08/07
2	Multimeter	Fluke	87	000159	10/13/06
3	Stop Watch	Radio shack	63-5017	000173	04/18/07
4	Leakage module	-	-	000199	Verified 05/04/06
5	Resitivity meter	WTW	3301	000339	Verified 05/08/06
6	Hipot	Biddle	230425	000055	03/07/07
7	Isolation transformer	Magtran	-	000148	Verified 05/07/06
8	Resistance box	-	-	000369	Verified 05/04/06
9	Force Guage	Chatilon	719	000040	06/06/06
10	Insulation tester	Amprobe	AMB-4D	000067	03/07/07



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Leakage current test section 41

Method

A cord-connected unit shall be subjected to a leakage current test in accordance with 41.2. The results are in compliance when the leakage current does not exceed 0.5 milliampere. The leakage current is to be measured through a 500 ohm noninductive resistor in parallel with a 0.45 microfarad capacitor connected between the grounded side of a power supply circuit and the part to be tested with the outer enclosure of the unit insulated from ground.

Result

Unit with cord was connected to rated power supply and following measurements were noted down.

Switch 1	Switches 2	Measured Leakage Current (mA)	Limits (mA)
Closed	Normal	25.6/500=0.05	0.5
Open	Normal	17.6/500=0.03	0.5
Closed	Reverse	24.6/500=0.05	0.5
Open	Reverse	11.6/500=0.02	0.5

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Available current test section 42

Method

The available current (isolated or ground-referenced) from a live part or circuit that is accessible to the occupant or in contact with water shall not exceed 0.5 milliampere during any mode of operation. The instrument used for this test shall be a milliammeter having an internal impedance of 500 ohms. As an alternative, a 500-ohm non-inductive resistance may be connected between the test points, and the available current calculated by dividing the voltage drop measured across the resistance by 500 ohms.

Result

Measured current between electrode in water and grounding is 58uAmp

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Insulation resistance test section 43

Method:

A permanently connected hot tub or spa and an assembly shall have an insulation resistance between live parts and noncurrent-carrying metal parts of not less than 250,000 ohms as determined by the use of a megohmmeter providing a test potential of 500 volts DC.

Results

Measured insulation resistance is:>5MOhms

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Humidity conditioning Tests section 46

Method:

Unit shall comply with the requirements for leakage current , following exposure for 48 hours to air having a relative humidity of 88 +-2 percent at a temperature of 32 +-2°C (90 +-4°F).

To determine whether a hot tub or spa complies, a sample is to be heated to a temperature just above 34°C (93°F) to reduce the risk of condensation of moisture during conditioning. The heated sample is to be placed in the humidity chamber and conditioned for 48 hours under the conditions specified above. Following the conditioning, the sample shall not exceeds limits of section 41.

Results:

Switch 1	Switches 2	Measured Leakage Current (uA)	Limits (mA)
Closed	Normal	25.6/500=0.07	0.5
Open	Normal	17.6/500=0.04	0.5
Closed	Reverse	24.6/500=0.06	0.5
Open	Reverse	11.6/500=0.03	0.5

Leakage current did not exceed 0.5mA

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Dielectric test section 47

Method:

While at the maximum operating temperature reached during intended use, each unit shall be subjected to the application of a 60 hertz potential as specified in Table 47.1. The test transformer shall have a capacity that is 500 volt-amperes or larger and an output voltage that is essentially sinusoidal. The applied potential is to be increased gradually from zero to the required test value, and then is to be held at that value for 1 minute. The result is in compliance when there is no dielectric breakdown.

Applied between	Potential (volts)
Live parts and grounded metal	1000
Transformer primary and secondary	2500
Accessible dead metal and live parts, grounded metal, and transformer secondary	1000
Tub/skirt material used in lieu of spacings as specified in 10.4 and 10.5	1000 ^a

^a Applied across actual thickness of material being used.

Result:

Model MT was operated till thermal stabilization and potential as per table above was applied between

- a) live parts and grounded metal,
- b) transformer primary and secondary

No breakdown observed

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Leakage current is water test section 53

Method:

For this test, the unit is to be supplied through an isolating transformer having the capacity to provide rated voltage during the test. The impedance of the milli-ammeter is not to exceed 500 ohms. As indicated in Figure 53.3, the ungrounded line terminal (or both, if there are two) for the equipment is to be connected to one transformer lead while the other transformer lead is to be connected to:

- a) The enclosure ground terminal,
- b) The neutral terminal, and
- c) One side of the measuring circuit.

The heating element is to be altered to meet the description given in Figure 53.4 so that approximately 1 inch (25.4 mm) of the heating element conductor connected to each heater terminal is exposed to contact with the water in the circulating system. The water is to have a resistivity of 300 ohm-centimeters. Measurements made in a hot tub or spa are to be made with the unit insulated from ground. The test tank used with an assembly is to be of insulating material with any metal hardware insulated from ground. The connection of noncurrent-carrying metal to the equipment grounding terminal is not to be disturbed, and any protective devices are to remain in the circuit. Water pipe connections between an assembly and the test tank are to be nonmetallic, no more than 5 feet (1.72 m) long, and of the same diameter as the water connections to the assembly. The current flow is to be measured to a copper electrode plate having dimensions approximately twice the internal diameter of the pipes through which the water circulates in the tub. The electrode is to be placed 1 inch (25.4 mm) from the inside walls of the tub directly over each water discharge and water pick-up port, one at a time, or 1 inch from the underwater point nearest to grounded metal that the occupant of the tub can reach while the electrical components are energized.

Figure 53.3
Connections in panel

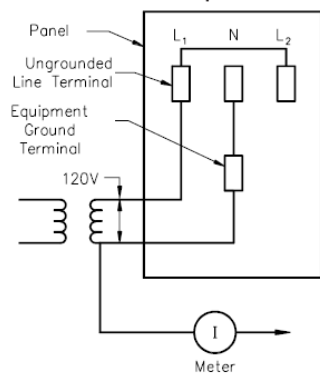
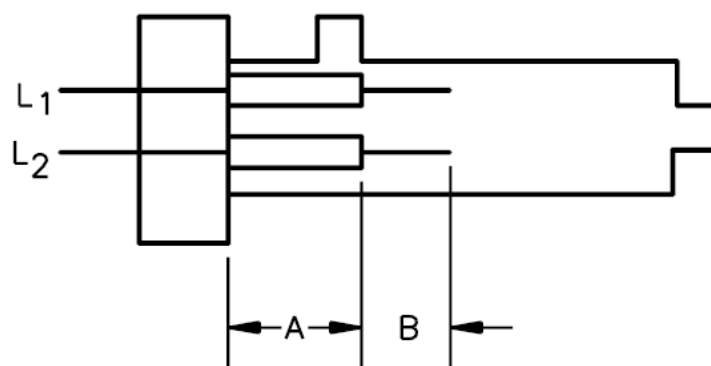


Figure 53.4
Altered element



Results: Model MT was connected as described above with heater prepared as shown in fig 53.4, a 6inch by 6 inch copper plate was used as electrode. Following was observed

- a) Unit provided with inherent GFCI shuts down power to controller immediately
- b) Unit not provided with inherent GFCI, measured leakage current is 0.41mA

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Strain relief test section 58**Method:**

The strain-relief means provided on a flexible cord shall be subjected to a direct pulling force of 35 pounds (155.7 N) applied to the cord for 1 minute, with the conductor connections within the unit disconnected.

A 35-pound pulling force (155.7 N) is to be applied to the cord such that the strain relief means will be stressed from any angle that the construction of the unit permits. The results are not in compliance when, at the point of disconnection of the conductors, there is such movement of the cord as to indicate that stress would have resulted on the connections.

Result:

The cord of cord connected unit sustained a direct pull of 15.9 kg (35 lbs) for 1 minute without transmitting any stress to the connections or disconnection of conductor.

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	Gulzar Singh	Test Date:	
		PASS/FAIL	