

SECTION 10: SYSTEM CHECKOUT AND TROUBLESHOOTING

PRELIMINARY CHECKS

CAUTION: DO NOT APPLY PRIMARY AC POWER UNTIL THE FOLLOWING CHECKS ARE COMPLETED

- Using an ohmmeter, measure and record all sensor resistances. To do this, disconnect the sensor leads from the sensor terminal block(s). Compare the sensor resistance values with the Resistance vs. Temperature chart below to determine if the sensor is indicating the approximate correct temperature. This test checks for shorts, opens or poor connections in sensor wiring.
- Check that all C35 loads and the C35 are properly **GROUND**ED and **BOND**ED. A **MUST** for safe operation.
- Check input AC wiring to the C35,
 - For **120 V**, connect to **WHITE** and **BLACK** pigtails.
 - For **240 V**, connect to **RED** and **BLACK** pigtails.

Make sure that a wire nut is installed on the unused pigtail.
- Check that all pump and other line loads are properly terminated, check pump and output module ratings.

Check valve wiring and ratings.
- Verify that there is no exposed valve or pump wiring in the vicinity of the pool, spa or hot tub.

TEMPERATURE (°F)	RESISTANCE (OHMS)	TEMPERATURE (°F)	RESISTANCE (OHMS)	TEMPERATURE (°F)	RESISTANCE (OHMS)
32	32,660	95	6,531	160	1,688
35	30,008	100	5,827	165	1,537
40	26,109	105	5,208	170	1,402
45	22,771	110	4,663	175	1,280
50	19,906	115	4,183	180	1,170
55	17,440	120	3,758	185	1,071
60	15,315	125	3,382	190	982
65	13,477	130	3,048	195	901
70	11,885	135	2,752	200	828
75	10,502	140	2,488	205	762
80	9,299	145	2,253	210	702
85	8,250	150	2,043	212	679
90	7,333	155	1,856		

FIGURE 10-1, RESISTANCE VS TEMPERATURE CHART

SYSTEM CHECKOUT USING TEST MODES. FOR ALL C35 MODELS

CAUTION: The front panel should be removed only by qualified service personnel. **Disconnect** input AC power before removing panel.

APPLY PRIMARY AC POWER TO THE C35

1. "POWER ON" indicator does not illuminate:
 - * Check circuit breaker
 - * Check pool timer (if control wired on switched side of timer).
 - * Check input power connections
 - * Check that the transformer is connected to the circuit board.
 - * C35 defective

2. Place the mode switch(es) to the "OUT" position. The "Output 1 (and "Output 2", "Nocturnal Cooling", or "Draindown" indicators if applicable) shall turn OFF. If not check:
 - * Freeze sensor(s) temperature may be below freeze threshold.
 - * Freeze sensor wiring may have open or poor connection. Check all connections, especially at collector.
 - * Defective freeze sensor. Momentarily short out each sensor to locate defective one.
 - * If freeze protection disabled, check freeze jumper connections.
 - * C35 defective.

3. If the Output indicator turns OFF, but the Pump/or Valve remains ON:
 - * Check pump or valve wiring.
 - * Defective LV or HV output module. Module plugged into wrong jack.
 - * Valve wired incorrectly or to Normally On output terminal.
 - * Diverter valve internal limit switch defective causing continuous cycling.
 - * Two 3-way diverter valves wired to same output are not synchronized.
 - * C35 defective

4. Place mode switch(es) to "ON". The "Sweep Enable" indicator should turn OFF for approximately six (6) minutes after mode switch is placed into the ON position. If a pool sweep pump is wired to the C35, the pump shall be disabled for this period. On Models C35-1S-2S-3T or C35- 1S-2S(DHW)-3T with internal jumper J2 installed, The "Sweep Enable" indicator will remain continuously OFF. "Output 1" (and "Output 2" indicators on Model C35-1S-2S-3T and C35-1S-2S(DHW)-3t) shall illuminate.

The "Nocturnal Cooling" indicator(Model C35-1SN-3T) will not illuminate with the mode switch in "ON" unless Nocturnal Cooling is in progress. The "Draindown" indicator (Model C35-1S-2F-3T) will not illuminate unless the Freeze sensors are above the freeze thresholds.

 - * If the Output indicators do not turn ON, the C35 is defective.

5. If the Output indicator turns ON, but the pump or valve does not operate:

- * Check pump or valve wiring for open circuits.
- * Defective pump or valve.
- * Defective Output Module, replace module.
- * Output module not connected to correct jack.
- * C35 defective.

SYSTEM TROUBLESHOOTING

IMPORTANT

At this point the installer must be completely familiar with the operating logic of the applicable C35 model used. See the operation section for control operating logic.

The C35 control performs the following basic functions:

1. Differential Temperature measurement (Collector minus storage temperature for control of solar collection).
2. "Temperature Adjust" limit.
3. Recirculate Freeze Protection.
4. Pool Sweep Interlock
5. Draindown Freeze Protection (Model C35-1S-2F-3T)
6. Nocturnal Cooling (Model C35-1SN-3T)
7. Priority storage heating (Dual differential models only)
8. Field modified collection logic for dual differential systems having one common collector array.

Each of the above control functions may be tested by simulating input sensor resistances with a sensor simulator or with fixed resistance values. A gross check may be made by momentarily opening and shorting sensor terminals. The following checkout methods may be used by qualified service personnel to locate system problems that are not detected with the previously performed test modes.

1. DIFFERENTIAL TURN ON/TURN OFF PROBLEMS.

CONTROL OUTPUT WILL NOT TURN ON OR COLLECTION STARTS LONG AFTER SUN RISES

- *Poorly insulated collector sensor
- *Collector sensor not located properly
- *Collector sensor or wiring "open circuited" or poor connection.
- *Wrong orientation of insolation sensor

- *Defective Storage sensor (water saturated, shorted etc.)
- *Pool above the "Temperature Adjust" setting.
- *C35 differential Turn On threshold not compatible with collector array used
- *C35 defective.

OUTPUT REMAINS ON CONSTANTLY OR COLLECTION CONTINUES AFTER SUN SETS

- *Recirculate freeze protection (if enabled) in progress.
- *Pool sensor "open circuited" or improperly insulated.
- *Storage sensor has poor wiring connections.
- *Collector sensor or wiring water saturated or shorted.
- *Storage and collector sensors interchanged.
- *Nocturnal cooling is operating because pool temperature is above limit setting.
- *Ambient air temperature warmer than pool.

Quick check of collection operation by opening or shorting sensor inputs at C35.

ON Open storage sensor circuit.

OFF Open collector sensor circuit, disable Recirculate Freeze Protection by shorting freeze sensor with jumper.

2. "TEMPERATURE ADJUST" HIGH LIMIT PROBLEMS

Control turns ON/OFF properly but the Pool does not get warm enough even with warmest setting of "Temperature Adjust".

- *Differential "Turn On" problems previously mentioned.
- *Insufficient collector area for volume of pool.
- *Solar valve defective.
- *Low ambient temperature.
- *C35 defective.

Pool gets too warm even with coolest setting of the "Temperature Adjust".

- *Long periods of high ambient temperatures.
- *Solar valve defective
- *Differential "Turn Off" problems previously mentioned.
- *C35 defective.

TEMPERATURE LIMIT CHECKOUT

*Short Collector Sensor

*Measure pool water temperature at pool sensor and compare sensor resistance for approximate temperature accuracy.

*On a sunny day slide "Temperature Adjust" control toward "WARMER". The "Output 1" indicator will turn ON when the high limit setting is above the actual pool temperature. The "Output 1" indicator will turn OFF when the adjustment is set below the pool temperature. Output 2 temperature limit may be checked by following the same procedure.

3. RECIRCULATE FREEZE PROBLEMS

SYSTEM FREEZES

- *Freeze sensor not located at coldest point on exposed collector or plumbing.
- *Collector/plumbing array did not warm up before freeze sensor reacted to stop recirculation.
- *Freezing temperatures too low for Recirculate Freeze Protection.
- *Recirculate flow rate too low.
- *Storage heat content insufficient to meet heating demand for freeze protection.
- *Plumbing run from pool (storage) to collectors too long.
- *Shorted or water saturated freeze sensor (check resistance vs. temperature).
- *C35 defective

A quick check of freeze operation:

Open circuit sensor wiring at freeze sensors, the applicable output shall turn ON to start freeze protection.

4. POOL SWEEP INTERLOCK PROBLEMS

The "SWEEP ENABLE" indicator operates normally, but the pool sweep pump does not turn OFF when the "SWEEP ENABLE" indicator turns OFF.

- *Pool sweep not wired to C35.
- *Output module contacts shorted.
- *Output module connected to wrong output jack.

The pool sweep pump does not operate even when the "SWEEP ENABLE" indicator is ON.

- *Pool sweep timer (if used) defective or set to OFF.
- *Defective output module.
- *Output module connected to wrong output jack.
- *Defective sweep pump.
- *Open circuit in sweep pump wiring.

5. PROBLEMS WITH DRAINDOWN FREEZE PROTECTION.

Collection system will not drain when the "DRAINDOWN OUTPUT" indicator turns OFF. System freezes.

- *Valve defective (sticking)
- *Output module defective or connected to wrong output jack.

- *Valve(s) wired incorrectly or wrong type valve(s) used.
- *Vacuum breaker defective or frozen closed.

Collection system drains too late to prevent collector freezing.

- *Sensor or sensor wiring problems as discussed in "Recirculate Freeze Protection" problems.

6. NOCTURNAL COOLING PROBLEMS.

Nocturnal Cooling never starts or starts long after the collector temperature is $>8^{\circ}\text{F}$ (Turn On threshold) below the pool temperature.

- *Pool temperature not above the "Temperature Adjust" setpoint.
- *Check for sensor faults as discussed for Differential Turn ON/OFF problems.
- *C35 defective

7. PRIORITY HEATING PROBLEMS

Storage system operated off the Output differential channel with "PRIORITY" mode selected does not reach "Temperature Adjust" setpoint before the storage in "AUTO" mode is heated.

- *Both channels are in "PRIORITY" mode.
- *Shorted storage sensor or wiring on "PRIORITY" channel. Check for differential turn ON/OFF problems
- *Output wiring causing reversed operation of storage heating.
- *Output modules connected to wrong output jacks. Reversed.
- *C35 defective.

Storage system operated off the Output channel in "AUTO" mode is never heated with solar even when the storage on the "PRIORITY" channel is above the "Temperature Adjust" setpoint.

- *Storage on "AUTO" channel is above "Temperature Adjust" setpoint.
- *Shorted storage sensor or wiring on "AUTO" channel. Check for differential turn ON/OFF faults.
- *Open circuit or poor connection in collector sensor wiring on "AUTO" channel. Check for differential turn ON/OFF faults.
- *Output module on "AUTO" channel defective. Connected to wrong output jack.
- *C35 defective.

8. PROBLEMS WITH FIELD MODIFIED COLLECTION LOGIC.

Output 1 does not turn ON when output 2 turns ON.

- *Internal field intalled jumper J1 is not installed.
- *C35 defective

Pool sweep interlock operates when Output 2 is ON.

- *Internal field installed jumper J2 is not installed.
- *C35 defective

RETURN/REPAIR PROCEDURE

Call or write Independent Energy Inc., Customer Service Department, and request a Return Goods Authorization number ("RGA NUMBER"). Ship the control **prepaid** back to the address shown below with the RGA number marked plainly on the outside of the shipping carton. Include details concerning the control failure. IE will repair (or replace, IE's option) and ship the control back to you with freight prepaid. Be sure to include a complete return address.

Return controls to:

INDEPENDENT ENERGY INC.
CUSTOMER SERVICE DEPT.
42 LADD STREET/P.O. BOX 860
EAST GREENWICH, R.I. 02818

PH. 401-884-6990

SECTION 11: CARE AND MAINTAINANCE

The Model C35 control is equipped with a rugged plastic enclosure that is designed to withstand normal outdoor use and requires little maintainance.

Follow these important guidelines for control care and maintainance:

- * To prevent water from entering the enclosure always keep the cover closed and latched when adjustments are not being made. When the cover is open, avoid splashing water or cleaning solutions on the front panel. Water entering the panel openings may cause permanent damage to the controls or control circuitry.
- * Do not use chemical cleaners to clean the enclosure or labels. Strong cleaners may react with the enclosure material or labels.
- * Periodically inspect the cover gasket for excess wear or damage. A worn or damaged cover gasket will allow water to enter the enclosure which will cause permanent control damage. If the gasket is defective cover the control with a plastic bag and contact IE for a replacement gasket.
- * If "Mode Switches" or "Temperature Adjust" controls are left in the same position for long time periods (e.g. over 6 months), cycle the controls back and forth several times when selecting new control positions. The C35 slide controls and switches have "self wiping contacts" that remove contact oxidation automatically when moved.