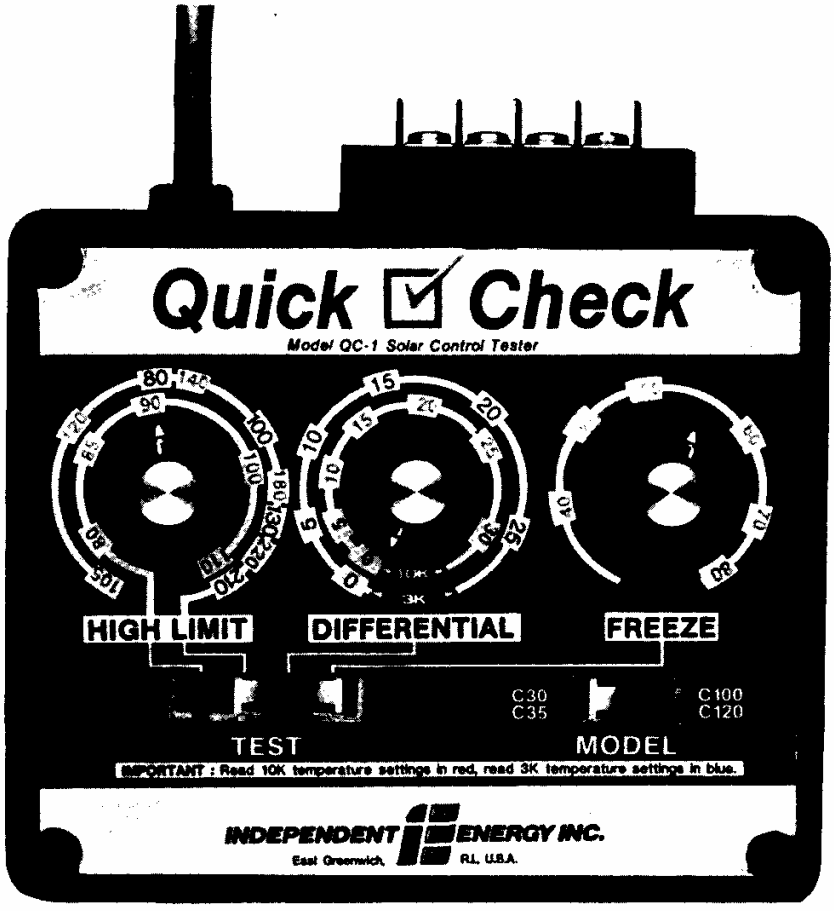
OPERATING INSTRUCTIONS

MODEL QC-1

SOLAR CONTROL TESTER



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MODEL C30-1S

The Model C30-1S performs three basic functions: differential temperature control, storage high limit, and recirculate freeze protection. All of these functions including options as described in the C30 brochure can be thoroughly tested using the QUICK CHECK Solar Control Tester and the following procedure.

A. BASIC TESTS

1. Disconnect all sensor wiring (leave the jumper between "W" and "R" in place) and verify proper sensors/wiring by using the procedure described on page 46 of this guide.

2. Install **FREEZE** jumper on "FREEZE" sensor terminals.

3. "POWER" light: When power is applied to the C30 the "POWER" light should illuminate--if not:

   *Use a voltmeter to check the power at the C30 "AC LINE" terminals. (102-130VAC for 115VAC controls; 187-253VAC for 230VAC controls.) If the voltage is incorrect then check the power wiring and the circuit breaker.

   *If the circuit breaker "opens" then the AC wiring or pump is most likely shorted. Make sure the problem is corrected before re-applying power--repeated current surges can permanently damage your C30.

   *Check that the screws holding the jumper betweeen the "W" and "R" terminals of the sensor terminal strip are securely tightened down.

   *If all of the above are normal then the C30 is defective.

NOTE: Some C30's do not have a switch in which case skip steps 4 and 5.

4. Switch "ON": Check that the "OUTPUT" light illuminates and the pump (if installed) operates--if not:

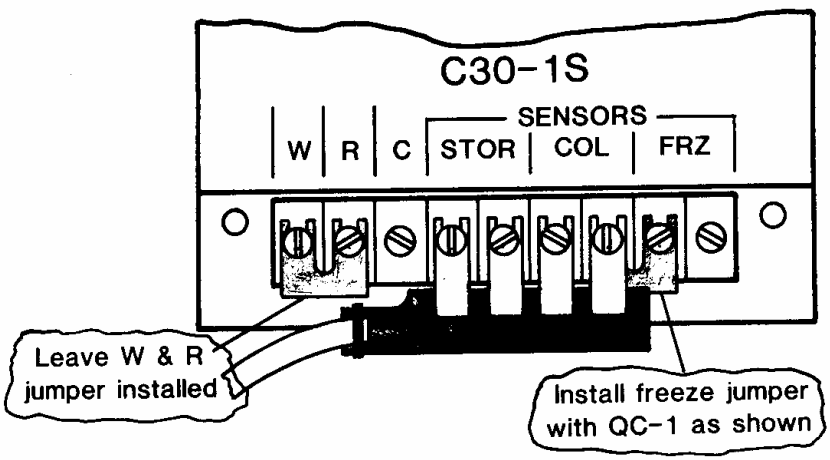
   *If the "OUTPUT" light does not illuminate then the control is defective.

   *Check the voltage at the "OUTPUT" terminals. If the voltage is approximately equal to the "AC LINE" voltage then either the pump or the connecting wiring is wrong. If the voltage on the "OUTPUT" terminals is 0 then the C30 is defective.

5. Switch "OFF": Check that the "OUTPUT" light and pump (if installed) are off. The "POWER" light will remain on.

   *Recirculate freeze protection can override the C-30 mode switch OFF position and turn on the output. Momentarily "short" the "FREEZE" sensor terminals to disable recirculation.

   *If the light is off but the pump runs then check the wiring from the C30 to the pump. Otherwise the C30 is defective.



Before proceeding further, the QUICK CHECK must be connected to the C30 as shown in the diagram. Ensure that the cable comes from the left as shown. Also check that all sensors are disconnected from the sensor terminals--they will cause erroneous results in the tests that follow.

FIGURE 1

B. DIFFERENTIAL TEMPERATURE TEST

IMPORTANT: For model C-30-1SH**(PADJ)** set the C-30 internal HIGH LIMIT adjust to its full clockwise position (110°F).

Place the QUICK CHECK "TEST" switch in the "DIFFERENTIAL" positon and the "MODEL" switch in the "C30/C35" position.

Adjust the center knob (the position of the other knobs is irrelevant) and note the output turn on and turn off points. The thresholds on standard C30's are 20%on/ 5%off (optional thresholds are indicated in the model no.; eg C30-1S(8/3)). If the control fails to operate or if the thresholds have shifted significantly (more than $\pm 4^{o}$F for turn on or $\pm 2^{o}$F for turn off) then the C30 is defective.

C. STORAGE HIGH LIMIT TEST

Place the QUICK CHECK "TEST" switch in the "HIGH LIMIT" position that is appropriate for your control. Only C30's with the "H(padj)" option will use the 80-110 scale, all other C30's will use the 105-220 scale. Adjust the left knob (again, position of the other two knobs is irrelevant) and note the point where the C30 output turns off. This point should approximate ($\pm 10^{o}$) the setting on the internal high limit adjust dial in the C30. Some C30's may have fixed high limits which are indicated in the model no.(e.g. C30-1SH(160). Also, some C30's have no high limit, (e.g. C30-1SH(none)) in which case check that the output turns off at 220 °F. If the control fails to operate or if the threshold has significantly shifted then the control is defective.

The high limit threshold has a small "deadband" (difference between where high limit turns the output off and where the output is turned back on). This "deadband" is very small (approximately $2^{o}F$ for C-30 controls) and its accuracy may be hard to interpret from the QC-1 scale markings. To test this function ensure that the Output turn off and turn on points are slightly different points on the QC-1 "High Limit" scale.

D. RECIRCULATE FREEZE PROTECTION TEST

IMPORTANT

Place the QUICK CHECK "TEST" switch in the "FREEZE" position and set the "DIFFERENTIAL" adjust knob to it's full counter-clockwise ("0") position (CCW). The position of the "HIGH LIMIT" adjust knob is irrelevent.

Adjust the "FREEZE" control (right knob) and note the points where the C-30 output turns on and off. Recirculation should start when the temperature falls to approximately 40 and stop when the temperature rises to 45. A major deviation ($\pm 5^{o}$) from these thresholds indicates a control problem.

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If you still suspect a problem exists, but no problems were identified after completing the above procedure (Did you check sensors per step A1?), then contact either the wholesaler from whom you purchased the control, the nearest IE Representative, or the IE factory for additional troubleshooting assistance.

MODEL C30-1S-2F

The Model C30-1S-2F performs the following functions: differential temperature control, storage high limit (forces pump off and, optionally, may initiate system drain, e.g. model C30-1S-2FH), and drain-down freeze protection. All of these functions can be thoroughly tested using the QUICK CHECK Solar Control Tester and the procedure outlined below.

A. BASIC TESTS

1. Disconnect all sensor wiring (leave the QC-1 or jumper installed at the "FREEZE SNAP SWITCH" terminals) and verify proper sensors/wiring by using the procedure described on page 46 of this guide. For the purposes of this test, short the "FREEZE SNAP SWITCH" terminals.

2. Install **FREEZE** jumper on "FREEZE" sensor terminals.

3. "POWER" light: When power is applied to the C30 the "POWER" light should illuminate--if not:

   *Use a voltmeter to check the power at the C30 "AC LINE" terminals. (102-130VAC for 115VAC controls; 187-253VAC for 230VAC controls). If the voltage is incorrect then check the power wiring and the circuit breaker.

   *If the circuit breaker "opens" then the AC wiring or pump is most likely shorted. Make sure the problem is corrected before re-applying power--repeated current surges can permanently damage your C30.

   *If all of the above are normal then the C30 is defective.

NOTE: Some C30's do not have a switch in which case skip steps 4 and 5.

4. Switch "ON": The valve output is <u>not</u> affected by the switch in this position. Check that the "PUMP" light illuminates and the pump (if installed) operates --if not:

   *If the "PUMP" light does not illuminate then the control is defective.

   *Secondary freeze protection overrides the C-30 mode switch "ON" position and can force both the pump and valve outputs off. Temporarily short the "FREEZE SNAP SWITCH" terminals to eliminate this possibility.

   *Check the voltage at the "PUMP" terminals. If the voltage is approximately equal to the "AC LINE" voltage then either the pump or the connecting wiring is wrong. If the voltage on the "PUMP" terminals is 0 and the "PUMP" light is ON, then the C30 is defective.

4. Switch "OFF": Check that the "PUMP" and "VALVE" lights and that both the pump and valve (if installed) are off. The "POWER" light will remain on.

*If the lights are off, but the pump or valve remain on, then check the wiring from the C30 to the pump or valve. Otherwise the C30 is defective.

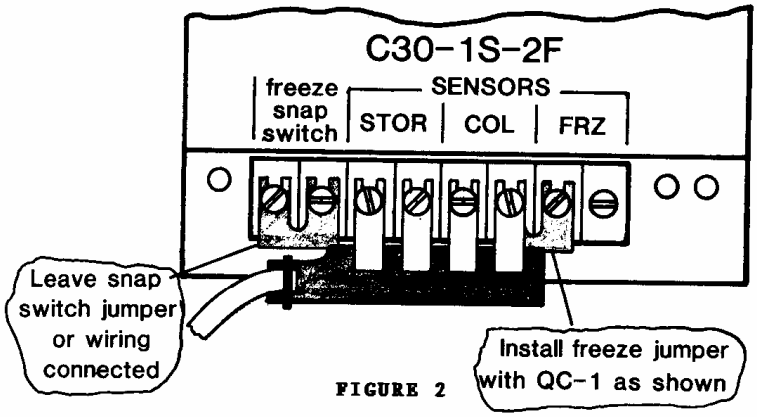

FIGURE 2

Before proceeding further, the QUICK CHECK must be connected to the C30 as shown in the diagram. Ensure that the cable comes from the left as shown. Also check that all sensors are disconnected from the sensor terminals--they will cause erroneous results in the tests that follow.

C30 -2F

B. DIFFERENTIAL TEMPERATURE TEST

IMPORTANT: For model C-30-1SH(**PADJ**) set control HIGH LIMIT adjust to it's full clockwise position.

Place the QUICK CHECK "TEST" switch in the "DIFFERENTIAL" positon and the "MODEL" switch in the "C30/C35" position.

Adjust the center knob (the position of the other knobs is irrelevant) and note the "PUMP" output turn on and turn off points. The thresholds on standard C30's are 20 on/ 5 off (optional thresholds are indicated in the model no.; eg C30-1S(8/3)). If the control fails to operate or if the thresholds have shifted significantly (more than $\pm 3^{o}F$) then the C30 is defective.

C. STORAGE HIGH LIMIT TEST

Place the QUICK CHECK "TEST" switch in the "HIGH LIMIT" position that is appropriate for your control. Only C30's with the "H(padj)" option will use the 80-110 scale, all other C30's will use the 105-220 scale. Adjust the left knob (again, position of the other two knobs is irrelevant) and note the point where the C30 output turns off. This point should approximate ($\pm 10^{o}$) the setting on the internal high limit adjust dial in the C30. Some C30's may have fixed high limits which are indicated in the model no.(e.g. C30-1SH(160). Also, some C30's have no high limit, (e.g. C30-1SH(none)-2F) in which case check that the "PUMP" output turns off at 220 ^{o}F. On controls with the high limit drain option (indicated in the model no.; eg C30-1S-2FH) then both outputs will turn off when the high limit is exceeded. If the control fails to operate or if the threshold has significantly shifted then the control is defective.

The high limit threshold has a small "deadband" (difference between where high limit turns the output off and where the output is turned back on). This "deadband" is very small (approximately 2°F for C-30 controls) and its accuracy may be hard to interpret from the QC-1 scale markings. To test this function ensure that the Output turn off and turn on points are slightly different points on the QC-1 "High Limit" scale.

D. **DRAIN-DOWN FREEZE PROTECTION TEST**

IMPORTANT

Place the QUICK CHECK "TEST" switch in the "FREEZE" position and set the "DIFFERENTIAL" adjust knob to it's full counter-clockwise ("0") position. The position of the "HIGH LIMIT" adjust knob is irrelevent.

Adjust the "FREEZE" control (right knob) and note the points where the C-30 "VALVE" output turns on and off. Drain-down should occur when the temperature falls to approximately 44 and refill when the temperature rises to 70. A major deviation ($\pm 5^{o}F$ on drain, or $\pm 10^{o}F$ on refill) from these thresholds indicates a control problem. To check secondary freeze protection with the system filled, remove the jumper from across the "FREEZE SNAP SWITCH" terminals, or "OPEN" the snap switch wiring at the "FREEZE SNAP SWITCH" terminals. The C-30 "VALVE" output should turn off, otherwise the C-30 is defective.

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If you still suspect a problem exists, but no problems were identified after completing the above procedure (Did you check sensors per step A1?), then contact either the wholesaler from whom you purchased the control, the nearest IE Representative, or the IE factory for additional troubleshooting assistance.