KI-1615

2401CC Crystal-Controlled Oscillator
Installation

RAULAND-BORG CORPORATION • 3450 West Oakton Street, Skokie, Illinois 60076-2951 • (708) 679-0900

General Information

Description

The Rauland Model 2401CC module may be added to any 2424 or 2490 Master Clock or 2480 Programmer in order to ensure accuracy to within two seconds per month. Without this module, the master clocks depend upon the accuracy of the power company's 60-Hertz line frequency. During a power failure, the master clocks derive a time base from internal software loops. In places where power failures are frequent or of long duration, or where the line frequency is not stable, the 2401CC is recommended.

The oscillator electronics are mounted on a 2½" by 2³/₁₆" (6.4 cm by 5.6 cm) printed circuit board. For the 2424 Master Clock, the 2401CC plugs directly onto the Zone Relay Module (ZRM). For the 2490 Master Clock, the 2401CC is provided with the hardware needed to mount it nearby and connect it to the 2490.

Unpacking

Mounting Parts Supplied with the 2401CC

Qty.	Description	Rauland Part No.
1	Circuit-board support, for mounting the 2401CC inside the 2424 Master Clock.	QP0656-1
4	Screws (#6-32 × ⅜" pan-head machine) for mounting the 2401CC externally (with the 2490).	WA60
4	Nuts (#6-32 hex-head) for mounting the 2401CC externally (with the 2490).	WB506
4	Spacers.	B0421-01

Caution

1. Do not attempt to adjust the trimmer capacitor. It has been carefully set with precision instruments at the factory; any deviation from this setting will lessen the oscillator's accuracy.

2. For optimum accuracy, the oscillator requires an operating temperature range of 68° F to 86° F (20° C to 30° C).

3. The module can be damaged by static electricity. Always wear a grounding strap when handling it.

Installation in the 2424 Master Clock

Note: In the following steps, terms such as "top" refer to the more usual horizontal installations of the 2424 (rack, turret, desk); for wall-mount installations (2424WN), construe "top" as "back," and "back" as "bottom."

Step 1. Remove the five screws securing the back panel, then set them and the panel aside.

Step 2. Locate Terminals *T3* and *T4* on the Zone Relay Module (ZRM) board (as you face the back, they are about one-half inch behind the leftmost screw terminal, *1A*). Using a screwdriver or a similar tool, short together *T3* and *T4*, taking care not to short anything else. LED *D13*, which is half an inch further in, should light: this confirms that Relay *RY9* is unlatched and, hence, that the battery is disconnected.

Note: An earlier model, 2424B, has a separate battery-disconnect module, whose terminals are labeled "T1" and "T2," and whose LED, labeled "D4," is right next to them.

Step 3. Unplug the master clock to disconnect the AC power.

Step 4. Remove the screw securing the vertical support bracket at the back of the printed circuit boards, then set the screw and the bracket aside. Find Terminal *Z* on the right side of the ZRM board. If it has a wire coming from the DPU board, disconnect that wire.

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Step 5. Pull out the Display Processing Unit (DPU) board, set it on a suitable work surface, and orient it so that you can read most of the screening.

Note: Alternatively, you may find it easier to remove the top cover, which will enable you to work on the DPU board without removing it.

Step 6. Cut zener diode *D1* (it is near the left side of the DPU board, to the left of *IC2* and to the immediate right of tantalum capacitor *C7*). Set the DPU board aside.

Step 7. Carefully pull the ZRM board part-way from the 2424 chassis, until you can access the "BATTERY" terminals (next to LED *D13*). Pull the connector from these terminals, then pull the connector from the nearby "TRANSFORMER OUTPUT" terminals. If the clock has a 2400IP Instruction/Monitor Panel, unplug its connector from the "OUTPUT" terminal strip (centered near the large relays). Remove the board from the clock chassis.

Step 8. Orient the ZRM board with the screw terminals towards you, then place the board on a suitable work surface. Cut Jumper *J1* (it is to the left of the row of resistors above *IC2*).

Step 9. Orient the white PCB supporter with its shorter stake (the one on the concave side of the curved flanges) downward. Handle this part gingerly: it could break. Insert the shorter stake into the small hole that is inside the three-inch square screened on the upper right section of the board.

Step 10. Place the 2401CC module on a suitable work surface and cut Jumper *JU1* (the jumper is under the connectors, to the left of the IC chip). The failure to cut this jumper could cause the 2401CC to draw excessive current from the 2424; among other things, this could overload the power supply of the master clock and cause it to malfunction.

Step 11. Orient the 2401CC module inside the square on the ZRM board so that its components face upwards and its connector is aligned with the 12-pin terminal strip. Carefully push the module onto the terminal pins and the PCB supporter until the board is firmly seated.

Step 12. Slide the ZRM board about two-thirds of the way back into the clock chassis, taking care that the edges of the board are properly aligned with the mounting tabs of the chassis. Reinstall the following connectors onto the board's pin terminals:

a. If the clock is equipped with the 2400IP panel, push its connector onto the "OUTPUT" terminal strip. The black edge on the ribbon cable should be oriented to the left (the side of the terminal strip with pin "C").

b. Push the transformer connector onto the "TRANSFORMER OUTPUT" terminal strip; so long as the four holes in the connector mate with the four pins, the connector may be oriented in either direction.

c. Push the battery connector back onto the ZRM board's "BATTERY" terminals. The connector is keyed.

Step 13. Push the back of the board firmly to ensure that its front edge connector is fully seated in the corresponding terminals on the Clock Control Panel (CXP).

Step 14. Replace the DPU board in the clock chassis (if you removed it in Step 6), taking care to properly align the board with the mounting tabs and to fully seat the front edge connector with the corresponding terminals on the CXP. If there is a ground wire coming from the middle of this board, reconnect it to Terminal *Z* on the ZRM board.

Step 15. Replace the vertical support bracket and tighten its screw.

Step 16. Test the installation by plugging the master clock into an appropriate AC power source and entering an event for a different time from what is shown on the display. If the master clock accepts this entry (and does not reset back to 08:00 am), then both the installation and the 2401CC itself are probably okay. After completing this test, make sure that LED *D13* is off, then short Terminals *T3* and *T4* together with a screwdriver or similar tool. After making sure that LED *D13* is now lit, unplug the clock again.

Step 17. Replace the back cover with its five screws. If necessary, reinstall the clock in its enclosure (rack, turret, etc.), consulting the appropriate installation manual (KI-1316 for the 2424NU, KI-1332 for the 2424WN).

Step 18. Restore AC power. Since the 2424's memory is cleared whenever all power is removed, you will need to reprogram the clock. Refer to KI-1316, the main manual for the 2424 series.

Installation in the 2490 Master Clock or the 2480 Programmer

The procedures for installing a 2401CC are the same for the 2490 and the 2480; to avoid awkward wording, the following steps mention only the 2490.

The 2490 Master Clock must be modified to work with the 2401CC. The latter must be mounted externally. On a standard 2490 clock, the oscillator module will be electrically connected via wires from its four-pin terminal strip to a corresponding terminal strip inside the master clock (as viewed from the back of the 2490, these terminals are just inside a special slot in the back panel and the top cover, about an inch to the left of the "ZONE 1" screw terminal). On 2490s that have a battery back-up, the wires will run from the 2401CC to the back-up module. #22-AWG solid wire is recommended for wire-wrapping.

Step 1. Select a flat surface for mounting the 2401CC. The location should:

- √ be close to the 2490 Master Clock;
- √ lie clear of all of the clock parts and connections so that it will not interfere with any servicing needs;
- √ have nothing protruding that could cause a short; and
- √ have an operating temperature that falls within the range specified for the oscillator module (68° F to 86° F–20° C to 30° C).

Step 2. Using the module as a template, mark four points on the surface that are centered on the four module stand-offs. To use the supplied machine screws

and nuts, drill four .156-inch holes (5/32" drill); to use thread-forming screws, such as Rauland's WA7 #6 × 3/8" hex-head screws (not supplied), drill four .120-inch-diameter holes (#31 drill).

Step 3. Line up the module with the holes, make sure that nothing will create a short with it, and secure it with the hardware selected.

Step 4. If the master clock has a battery back-up, pull its connector off the "BAT" pin terminals on the back-up module.

Step 5. Unplug the master clock. If necessary, remove the clock from its rack or other enclosure to gain access to its interior components.

Step 6. Loosen, but do not remove, the two screws that secure the top cover of the clock to its back panel, pull up on the rear of the cover to disengage it from the screws, then remove it by pulling it backwards.

Step 7. Modify the 2490 by removing Jumper *J3* from its printed circuit board, near the four-pin terminal to which the oscillator or the battery back-up is connected.

Step 8. If the clock has a battery back-up connect the 2401CC to the Battery Back-up Module. If it does not, use the following procedure to connect the 2401CC directly to the clock:

Use individual wires (not provided): these should be 22-gage solid wires, ideally of three different colors. Cut three lengths that will reach from the clock to the 2401CC module; be sure to allow extra length for the wire-wrapping connections. Connect a wire to each of these terminals: "C," "+5," and "Z." Make a note of the color wire used for each connection or, better yet, label the wires.

Step 9. Be sure to route the wires or the cable over the slot in the rear panel, then replace the top cover, check for pinched wires, and tighten the two screws. If necessary, reinstall the clock in the rack or other enclosure, following the procedures in the 2490 manual, KI-1496 (the manual for the 2480 is KI-1430).

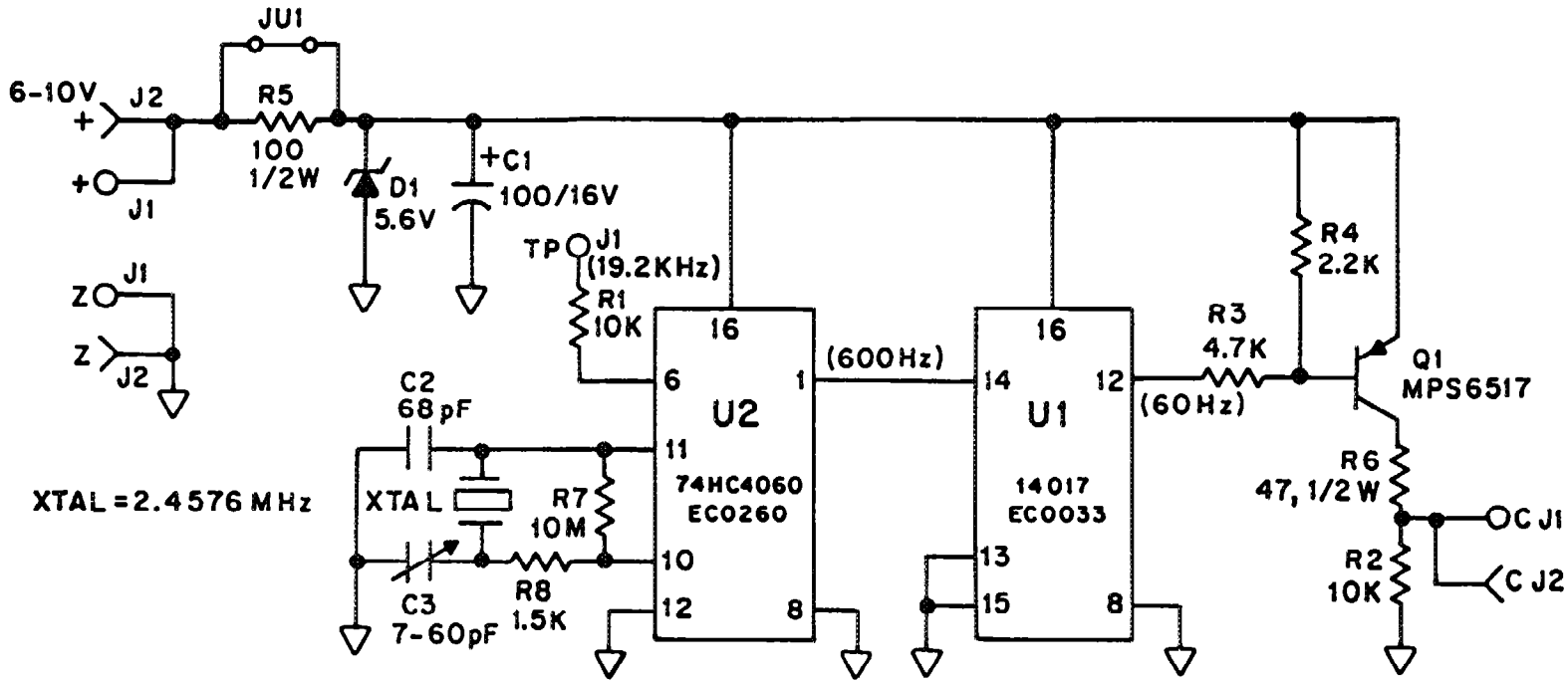
Step 10. Complete the wiring to the 2401CC. If there is a battery back-up, it is wired from "CONN 1" to the four-pin terminal in the master clock, and from "CONN 2" to the 2401CC. If there is no battery back-up, the 2401CC is wired directly to the master clock. Choose the appropriate terminals from the following table:

2490, 2480, or 2454	2401CC
Terminal +5	Terminal +
Terminal Z	Terminal Z
Terminal C	Terminal C

Step 11. Reconnect the master clock to its AC power source. If there is a battery back-up, reconnect the leads from the battery to the "BAT" terminals of the back-up module; be sure to observe the polarity.

Step 12. Test the installation by entering the proper time, then waiting a minute to make sure that the time advances normally (should the 2401CC be defective, the clock's display would continue to show the time entered).

Step 13. Enter the time and the day, following the procedures in KI-1496, the main manual for the 2490 (or, for the 2480, KI-1430). This is all of the reprogramming that is necessary: even with all power off, the 2490 will retain its event programming.



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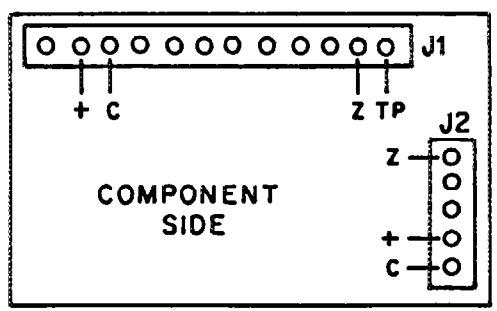
NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS RATED IN OHMS ±5%. RESISTORS ARE 1/4 WATT.
2. CAPACITANCE IS RATED IN MICROFARADS. pF = PICOFARAD
3. ⏚ = CONNECTION TO CIRCUIT COMMON.



MODEL 2401CC
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