



2480 EIGHT-ZONE PROGRAMMER
INSTALLATION AND OPERATION

RAULAND-BORG CORPORATION • 3535 West Addison Street, Chicago, Illinois 60618 (312) 267-1300

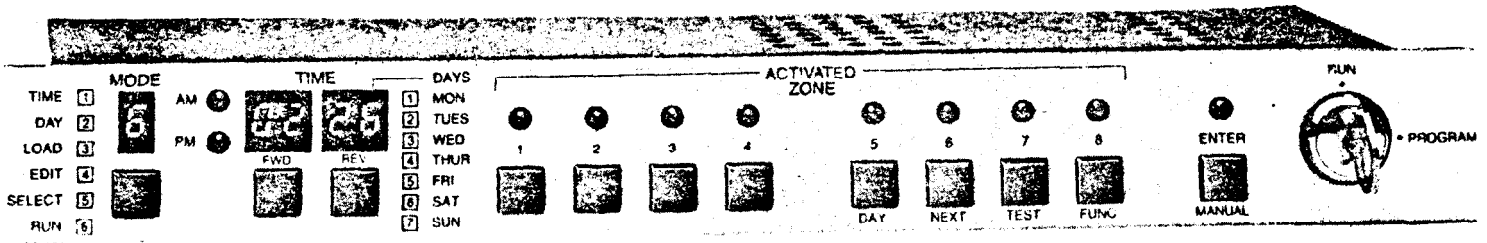


Figure 1. Model 2480 Eight-Zone Programmer

TABLE OF CONTENTS

<u>GENERAL</u>	3
DESCRIPTION	3
Functions	4
Options	4
<u>SPECIFICATIONS</u>	6
<u>FRONT PANEL DESIGNATIONS</u>	7
<u>REAR PANEL DESIGNATIONS</u>	10
<u>INSTALLATION</u>	12
GENERAL	12
Event Programming Chart	12
<u>MECHANICAL ASSEMBLY</u>	15
GENERAL	15
Rack and Turret Mounting	15
Desk-Top Cabinet Mounting	15
Connecting Model 2480 Outputs	16
<u>OPERATION</u>	17
GENERAL	17
PROGRAMMING (Modes 1-5)	17
Applying Power	17
Selecting 12- or 24-Hour Format	17
Setting Present Time (Mode 1)	17
Daylight Saving Time Changes	18
Setting Present Day (Mode 2)	18

TABLE OF CONTENTS (Cont'd)

OPERATION

PROGRAMMING (Cont'd)

Programming TIME and ZONE Events (Mode 3)	18
Reviewing Programmed Events (Mode 4)	19
Editing of Events (Mode 4)	19
Selecting Zones (Mode 5)	19
Selecting Run Mode (Mode 6)	19
Display in Run Mode	19
RUN MODE	20
Manual Activation of Zones	20
Displaying the Day of the Week	20
THE PREVIEWING MODES ("NEXT" and "TEST")	21
General Principles	21
Displaying Next Event	21
Testing Events	21
Using the "FUNC" ("Function") Button	22
SPECIAL PROGRAMMING	23
GENERAL	23
Day/Zone Program Chart	23
Duration Program Chart	25
Preparation for Special Programming	26
Setting Zones for the Day of the Week (Mode 7)	26
Duration for Each Zone (Mode 8)	27
Programming in Mode 9	27
Pushbutton Operation when the Manual Controls Are Disabled	28
Using the Model 2480 as an Expander	28
Bulk Programming	29
Bulk Erasing	29
Clearing Memory	29
RESETTING THE 2480 AFTER A POWER FAILURE	29
(1) As a Stand-alone WITHOUT a Battery Backup	29
(2) As a Stand-alone WITH a Battery Backup	29
(3) As an Expander for a Clock WITHOUT a Battery Backup	30
(3) As an Expander for a Clock WITH a Battery Backup	31

<u>ABBREVIATED OPERATING INSTRUCTIONS</u>	32
---	----

<u>PARTSLIST</u>	34
------------------	----

ATTACHMENTS:

Event Programming Charts	
Duration and Day/Zone Program Charts	
Model 2480 Programmer in School-Sound and Telecenter Systems KM0678A
Using the 2480 as an Expander with Rauland Master Clocks IL0201
Model 2480 Programmer Schematic KC1470A
Model 2480 Programmer (for units manufactured after 1986) KC1535A

ASSOCIATED DOCUMENTATION:

Model 2418	Solid State AC Buffer	KI-1386
Model 2419	Solid State DC Buffer	KI=1387

GENERAL

This manual provides description and procedures for installation and operation of the Rauland Model 2480 Eight-Zone Programmer. Instructions are also provided to record event information on the Event Program Chart.

It is desirable to read through the entire manual before beginning programmer installation. Pay particular attention to information on the various programming charts, correctly programming the clock in each mode, and using the appropriate sequence to program the clock. Extra charts are provided at the end of this manual.

DESCRIPTION

The Rauland Model 2480 Eight-Zone Programmer is a microprocessor-based Master Time/Program Clock. It is designed for easy programming by the user, with the guidance of the step-by-step instructions provided.

The Model 2480 Programmer is capable of controlling up to a total of 1440 events. Event information is stored in non-volatile memory. Each event is readily programmed for the time at which the event is to occur (AM or PM) and any one zone or combination of zones (up to 8) where the event is to take place. Any combination of zones can be programmed to be selected for each week day. The event duration is programmable and a separate duration can be set for each zone. Duration for events may be programmed from 1 to 59 seconds for momentary operation of zones, or programmed "zero seconds" to toggle for ON/OFF operation. Activated zones are monitored on front panel **LEDs**.

Programming the clock is accomplished by pushing the appropriate buttons to set up the event. The event information is fully displayed on the front panel and then entered into memory by the touch of a button.

All events may be readily reviewed and displayed in the time sequence they are programmed to occur. Similarly, any entered event requiring changes may be easily displayed and the required changes accomplished. Events may also be tested in sequence, beginning at the current time.

The Model 2480 Eight-Zone Programmer provides eight buttons for manual control of each of the zones. There is also provision to disable manual control when desired. When manual control is disabled, events are controlled solely by software programming.

Adjustments necessitated by daylight savings changes are accomplished by changing the hour in the TIME mode.

In the event of a power failure, all the programming of events is retained in the programmer's non-volatile memory. Once power has been restored, the programmer signals the power failure by flashing the time display. Upon restoration of power, only "Time" and "Day" need to be reset (exactly as in conventional alarm clocks). An optional battery back-up module can be provided to keep the time and day current during a power failure.

In addition to the basic functions of time keeping, event programming and event execution, the Model 2480 Programmer provides the following features:

- a) Pushbuttons for manually controlling each zone.
- b) Ability to program events for a unique combination of zones for each weekday.
- c) Ability to be synchronized by the Models 2450, 2424NU, and 2424WN Master Clocks and hence used as an expander.
- d) Display of the next scheduled event on the clock by pushing a single button.
- e) Display of activated zones on front panel of programmer.
- f) Ability to be used for energy control without external latching relays.
- g) A **key** lock to prevent tampering with the clock or making unauthorized program changes.
- h) Special programming to disable manual control of zones.
- i) A 1 to 59 second adjustable signal duration for each zone.
- j) Toggle (ON/OFF) operations with zero duration.
- k) Selection of 12-hour or 24-hour time display format.
- l) Bulk programming of a number of repeating, consecutive events.
- m) Bulk erasing of a number of consecutive events.
- n) Clearing of all events.

The following is a list of options associated with the Model 2480 Eight Zone Programmer:

- a) Battery Back-Up Module.
- b) Crystal control of time-base.
- c) Companion instruction panel for rack-mounted units that details programming procedure in step-by-step sequence.
- d) AC Output Buffer Module.
- e) DC Output Buffer Module.
- f) Wall Mounting Kit and Flush Mount Trim Accessory.

The power requirements for the Eight-Zone Programmer are 120 volts AC, 60 Hz. The clock incorporates all-solid-state circuitry, mounted on a glass epoxy printed circuit board and positioned within a metal chassis.

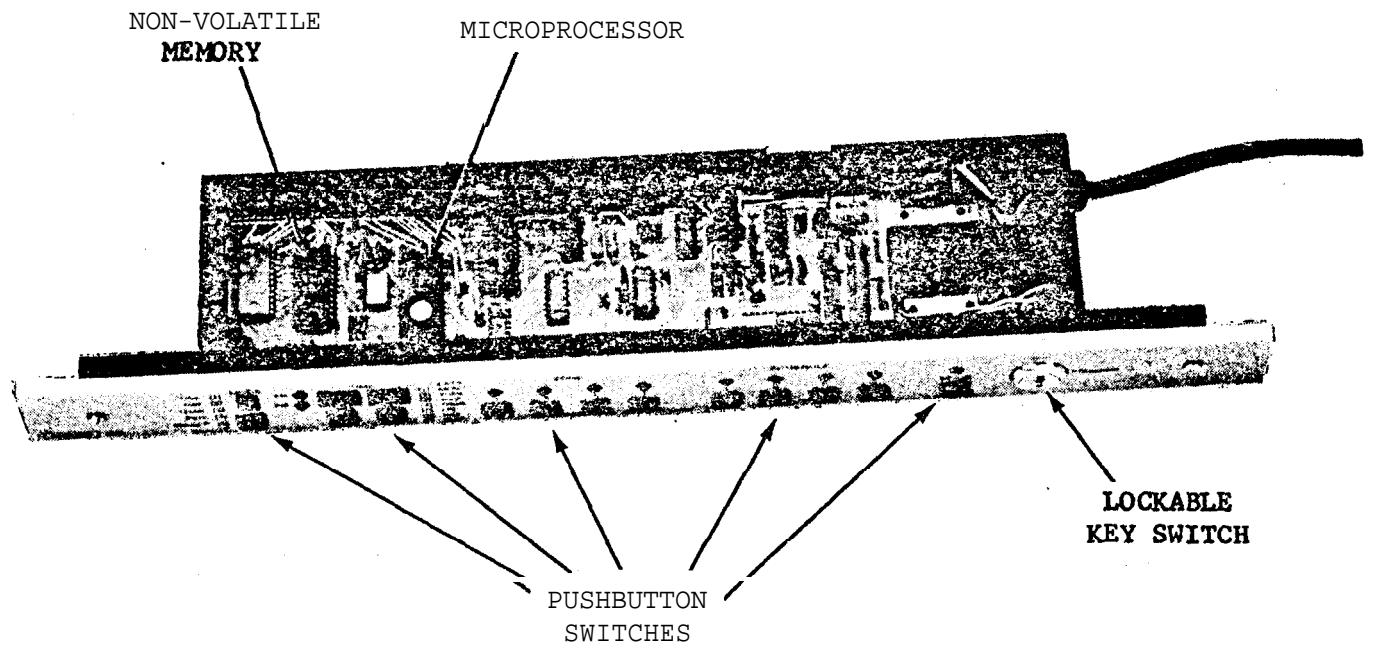


Figure 2. Model 2480 Eight-Zone Programmer

Note: The illustration above applies to models manufactured before 1987. The newer model has three chips that replace the two labeled above: (1) The new microprocessor is in Socket U4, in approximately the same location as the old one; (2) the program EPROM is in Socket U13, at the upper left corner of the board; and (3) the EEPROM for storing events is in Socket U3, in between the microprocessor and the program EPROM.

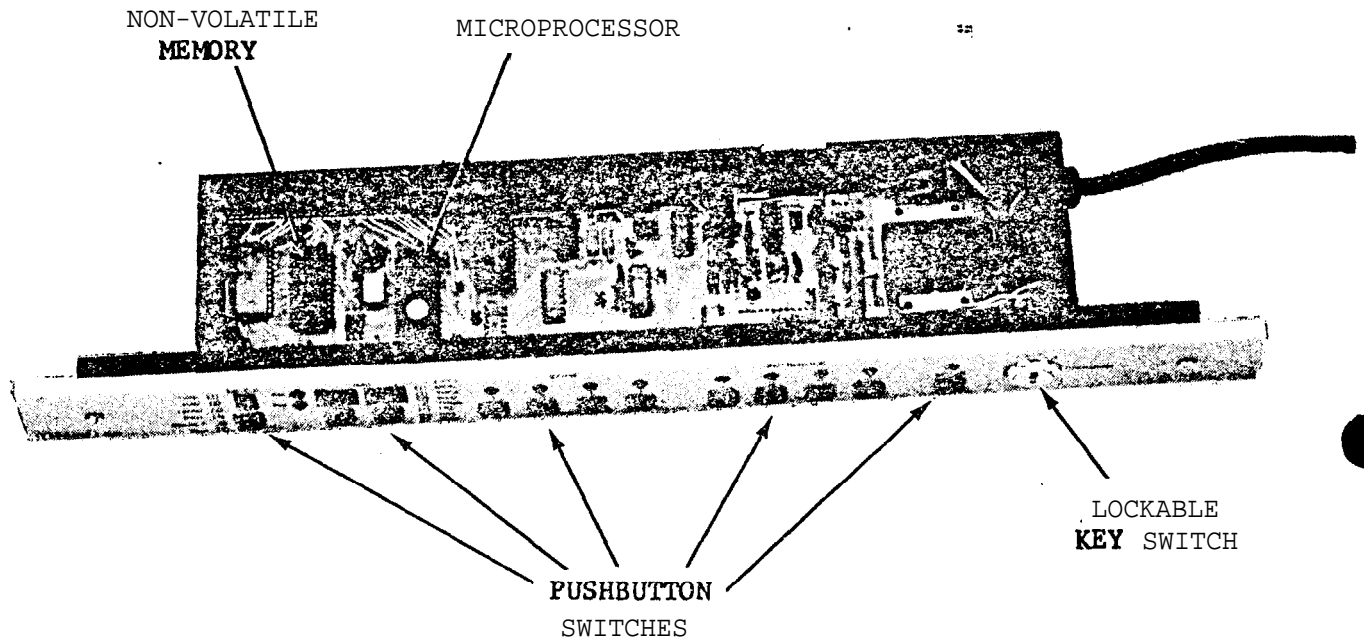


Figure 2. Model 2480 Eight-Zone Programmer

Note: The illustration above applies to models manufactured before 1987. The newer model has three chips that replace the two labeled above: (1) The new microprocessor is in Socket U4, in approximately the same location as the old one; (2) the program EPROM is in Socket U13, at the upper left corner of the board; and (3) the EEPROM for storing events is in Socket U3, in between the microprocessor and the program EPROM.

W A R N I N G

THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THIS **INSTRUCTION MANUAL**, MAY CAUSE INTERFERENCE TO RADIO COMMUNICATIONS. IT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS "A" COMPUTING DEVICE PURSUANT TO SUBPART J OF PART 15 OF FCC RULES WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFERENCE WHEN OPERATED IN A COMMERCIAL ENVIRONMENT. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE INTERFERENCE, IN WHICH CASE THE USER AT HIS OWN EXPENSE WILL BE REQUIRED TO TAKE WHATEVER MEASURES MAY BE REQUIRED TO CORRECT THIS INTERFERENCE.

FRONT PANEL DESIGNATION

To gain a general understanding of Model 2480 controls and indicators, refer to Figure 3 when reading the following descriptions.

KEY SWITCH..Selects either RUN (6) (normal) to execute the programmed events, or PROGRAM mode to program the clock. TIME (1), DAY (2), LOAD (3), EDIT (4), or SELECT (5) can be selected in the PROGRAM Mode.

When the key switch is placed in the PROGRAM position, the following push-button switches and indicators become enabled for a particular function:

MODEAn LED digit numerically displays the selected mode of operation; TIME is indicated by 1, DAY by 2, LOAD by 3, EDIT by 4, and SELECT by 5. A non-locking pushbutton switch is used to sequentially select modes 1 through 5. This switch is located below the mode display LED.

TIME (1)When selected, enables the TIME of day to be set.

DAY (2)When selected, enables the DAY of week to be chosen.

LOAD 3When in the LOAD mode, the 2480 Programmer is enabled to accept event programming (TIME and ZONE).

EDIT (4)When in the EDIT mode, events stored in memory can be sequentially reviewed, ZONE information can be modified or deleted.

SELECT (5)When in the SELECT mode, enables the selection, activation or deactivation of zone(s).

AM/PMIlluminated LEDs indicate AM or PM time during 12-hour clock operation. The LEDs do not light during 24-hour clock operation.

TIMEFour 7-segment LEDs display the time in hours and minutes. These digits show TIME in Modes, 1, 3, 4 and 6. The right-most LED of the TIME display shows the day of the week in Mode 2 or when the DAY button is pushed in Mode 6.

- FWD..... (Forward) Non-locking dual function pushbutton switch used in TIME mode to increment time in minutes (rapidly depress and release) and hours (depress and hold) until the desired time appears.
- REV..... (Reverse) Non-locking dual function pushbutton switch used in TIME mode to decrement time in minutes (rapidly depress and release) and hours (depress and hold) until the desired time appears.
- DAYSA single digit LED is used to identify the day of the week when the DAY mode is selected. To sequentially **increment or** decrement the days of the week, the FWD or REV pushbutton is used.
- ZONE..... The **LEDs** light to indicate zone selection for time event programming when the associated ZONE pushbutton switches are used. The clock should be in the LOAD 3, EDIT **4**, or SELECT 5 mode.
- ENTER.A pushbutton switch used to enter time event information into memory. The LED associated with this pushbutton flashes to alert the operator to push the ENTER button to store the selected information into memory.

When the key switch is placed in the RUN position, the following pushbutton switches and indicators become enabled for a particular function:

- MODEThe LED displays the digit six (6) to indicate the normal clock RUN mode.
- ZONEWhen pushed with the MANUAL button depressed, causes the corresponding ZONE to activate until any button is pushed, unless Toggle ON/OFF mode is selected,
- BUTTONS
- DAYWhen depressed, changes the TIME display to DAYS to numerically show the present day.
- NEXTWhen depressed, causes the LED indicators on the front panel to momentarily blank. The display reappears showing the NEXT scheduled event in terms of time and zone.
- TESTMomentarily depress this pushbutton to review the next programmed event, but not activate the programmed zone(s) for this event. The TIME display and ZONE **LEDs** begin to flash to indicate the clock is in the TEST mode.
- FUNC**To** exit from the TEST mode, depress the FUNC switch. Used to display Toggle zones (with zero duration).
- MANUALHolding in this button enables you to activate any zone by pushing that zone's button (see page 20 for a complete explanation).

* THE SWITCHES PERFORM THE GREEN-LETTERED FUNCTIONS ONLY WHEN THE KEY SWITCH IS IN THE "RUN" POSITION.

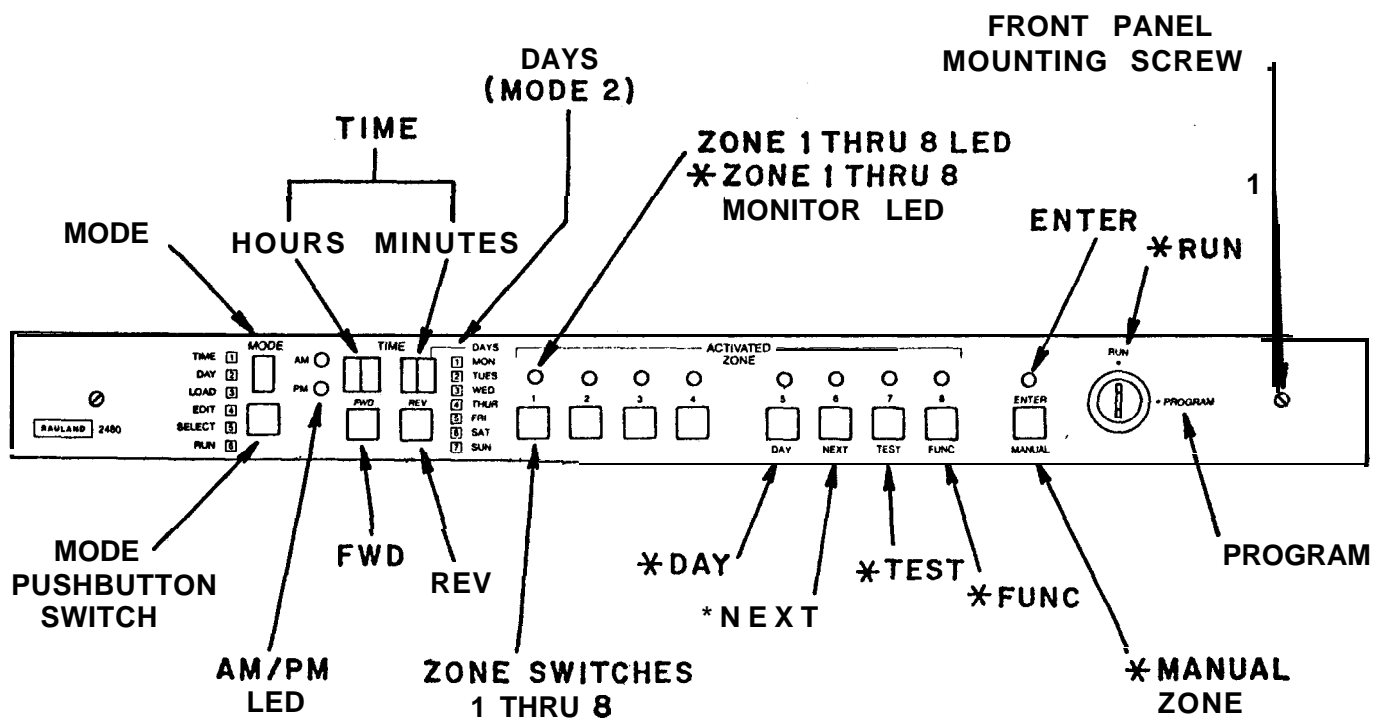


FIGURE 3. Model 2480 EIGHT-ZONE PROGRAMMER (FRONT PANEL)

REAR PANEL DESIGNATIONS

The following is a list of Rear Panel Designations (Figure 4):

- ZONE (Terminals 1, 2, 3, 4, 5, 6, 7 and 8) Provides a solid-state output (current sink). The rear panel terminals correspond with the front panel zone pushbuttons to activate devices.
- X Not used with Model 2480 Programmer.
- IN (Input) Designated for **input** from an external device. Serial data is input from a Model 2450 **or Model 2424NU** Master Clock to use the Model 2480 Programmer as an Eight-Zone Expander. See "Programming in Mode 9").
- + Used for stated specific auxiliary supply. (5 VDC, 100 mA)
- Used for stated specific auxiliary supply. (Refer to "Connecting Model 2480 Outputs".)

TO REMOVE TOP COVER, LOOSEN MOUNTING SCREWS.
LIFT TOP COVER.

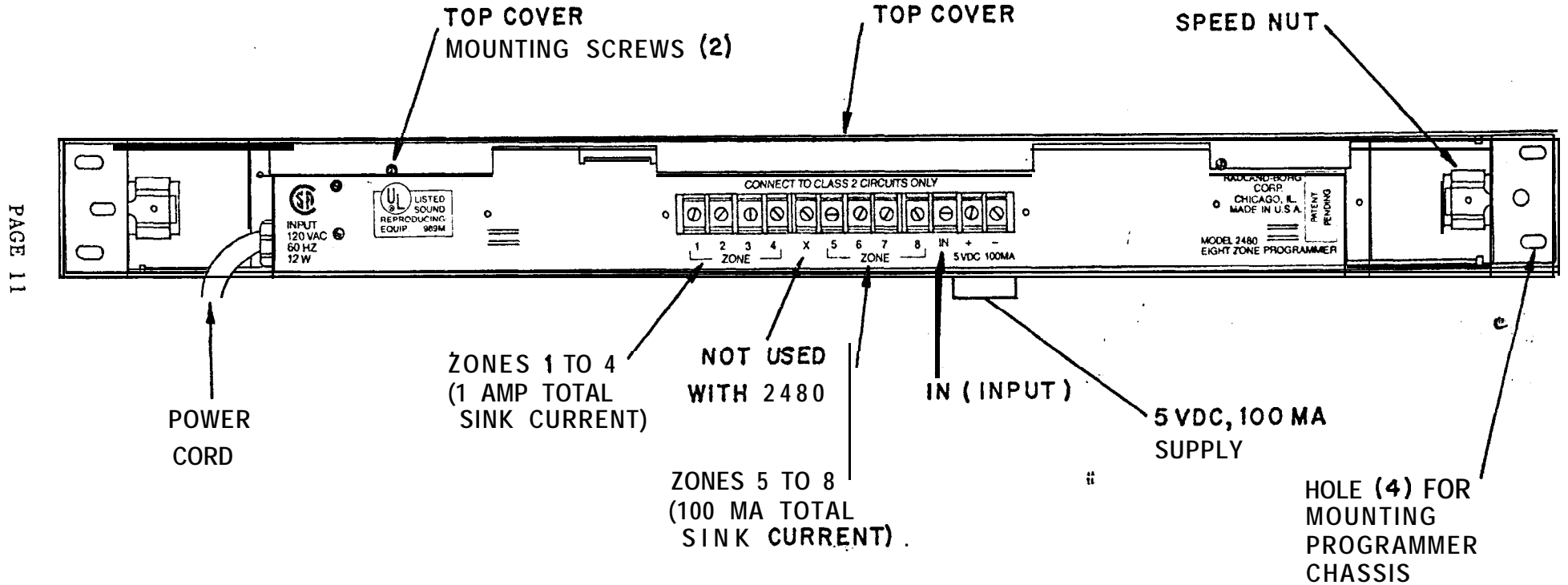


FIGURE 4. MODEL 2480 EIGHT ZONE PROGRAMMER (REAR PANEL)

INSTALLATION

GENERAL

The Model 2480 Programmer is shipped fully assembled. Hardware required for either rack or desk-top cabinet mounting is packed with **the unit**. Locate the mounting hardware before discarding packing material.

The Programmer is carefully checked and tested before leaving the factory. If the unit has been damaged, carefully inspect the shipping container and the unit for indication of improper handling. Notify the transportation company without delay to place your claim.

Programmer installation and initialization are accomplished through completion of a logical series of steps that include the **following**:

- a) Completion of the various programming charts.
- b) Mounting the unit.
- c) Connecting the programmer outputs.
- d) Applying power.
- e) Programming the unit.

Event Programming Charts

It is recommended that the Event Programming Chart be completed prior to actual installation of the Programmer. This ensures a smooth progression from hardware installation through unit initialization and programming.

Event Program Charts are included in this manual. The chart provides a schedule planning tool, an aid to orderly programming and a hard copy of programmed events for administrative records.

The columns on the Event Program Chart correspond directly to the layout of the Programmer's front display panel and to the order in which data is entered for each event during programming. For each event, enter a line of information on the chart as follows. (Sample entries are provided in Figure 5.):

EVENT NO. Sequentially write the number of the event in this column starting with number 1. The unit can store an event for each minute of a day. Since there are 1440 minutes in a 24-hour day, the maximum number of events which can be stored in memory is 1440.

NOTE: Each EVENT NO. identifies a row of time event information and is for reference only. When recording this information, it may be desirable to occasionally skip an event number and leave a row of information blank for future program corrections or additions.

TIME..... In this column, enter the hour and the minute when the event is to occur. For the 12-hour clock format, the time in hours ranges from "01" to "12." For the 24-hour clock format, the time in hours ranges from "00" to "23."

AM/PM.Use this column only for 12-hour clock applications. Enter a checkmark in the appropriate subcolumn to specify whether the time entered in the previous column is "AM" or "PM." Skip this column for 24-hour clock applications.

ZONESEight zones are available. Eight subcolumns are provided under 'ZONES' to correspond with the eight customer-selected zones for which events can be programmed. For each event, enter a checkmark in the subcolumn for each zone (or zones) in which a momentary event is to occur, a "T" for when a "Toggle" event is to begin, and an "O" for when a "toggle" event is to turn "Off" (see Note 4 below).

Notes:

1. You can program the clock in the 12-hour mode and then run it in the 24-hour mode, and vice versa.
2. When more than one zone is activated or turned off at the same time, the combined actions are considered to be one 'event' and all of them should be entered onto the same line of the Event Chart.
3. The 2480 is basically a single-schedule programmer. If an application requires more than one schedule, wire the same external equipment (speakers, power equipment, lights, etc.) to more than one zone and then program each zone with a different schedule.
4. "Momentary" events are those that last for less than a minute, like sounding a time signal. These are set by programming a zone's duration (Mode 8) from 1 to 59 seconds. These events need only a "turn-on" time, because the 2480 will automatically turn them off after the specified number of seconds have passed.

"Toggle" events, like toggle switches, remain on or off until they are changed. This setting is useful for controlling lights, heating and cooling equipment, etc. These events need both a "turn-on" time and a "turn-off" time.

To set a zone for the "Toggle" mode, program its duration (Mode 8) for "00." A "Toggle" event set for a time ending in an even minute (1:02, 7:28, etc.) will turn the zone 'On'; a "Toggle" event set for an odd minute (1:01, 7:29, etc.) will turn the zone "Off." Once it has been turned "On," a zone can be turned "Off" only by an "Off" signal; it is not affected by additional "On" signals. Similarly, a zone that is "Off" can only be activated by an "On" signal.

EVENT PROGRAM CHART MODEL 2480

EVENT NO.	TIME		AM/PM		ZONES *							
	HRS.	MINS.	AM	PM	1	2	3	4	5	6	7	8
1	08	00	✓		✓	✓	✓	✓	✓		T	
2	08	02	✓									T
3	08	35	✓				✓	✓	✓			
4	08	40	✓ _{AM}	PM	✓ ₁	✓ ₂	✓ ₃	✓ ₄	✓ ₅	6	7	8
5	08	45	✓		✓	✓	✓	✓	✓		O	
6	09	00	✓		✓	✓	✓	✓		✓ ₆	T	
			AM	PM	1	2	3	4	5	6	7	8
7	09	30	✓		✓	✓	✓	✓		✓		
8	10	00	✓		✓	✓	✓	✓	✓			
9	10	05	✓ _{AM}	PM	✓ ₁	✓ ₂	✓ ₃	✓ ₄	5	✓ ₆	O ₇	O ₈
10	01	30		✓	✓	✓	✓	✓		✓		
11	02	30	AM	✓ _{PM}	✓ ₁	✓ ₂	✓ ₃	✓ ₄	✓ ₅	6	7	8
12	03	00		✓	✓	✓	✓	✓	✓			
13	04	00		✓	✓	✓	✓	✓				
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8

*** NOTE: "✓" INDICATES "MOMENTARY" ZONES ACTIVATE.
 "T" INDICATES "ON" AND "O" INDICATES "OFF" FOR
 "TOGGLE" ZONES.**

Figure 5. Typical Entries on the Event Program Chart Using the 12-Hour Clock Format

MECHANICAL ASSEMBLY

GENERAL

The Model 2480 Programmer measures 19" (48.2 cm) wide (front panel), 1-3/4" (4.44 cm) high and 3-3/4" (9.53 cm) deep. The clock may be installed in a standard 19-inch rack, turret or Rauland desk-top cabinet. The Model 2481 Wall Box Mounting Kit will also accommodate the programmer. Wall box installation is covered in a separate manual.

Rack and Turret Mounting

The Model 2480 Programmer is designed for mounting in a standard 19-inch rack. The unit requires only 1-3/4 inches of vertical rack space. To mount the Programmer in a rack or turret, proceed as follows:

- a) Loosen the two screws securing the front panel to the Programmer chassis and remove the panel.
- b) At the selected mounting position, slide the four speed nuts supplied over the mounting holes in the channel rails. The smooth side of the speed nuts must face toward the outside of the channel rails. If the channel rail holes are tapped, do not use the speed nuts.
- c) Position the chassis in the rack and secure it to the channel rails using the screws provided.
- d) Replace the front panel on the chassis.

Desk-Top Cabinet Mounting

The Programmer may also be mounted in the Rauland Model PCB300 Desk-Top Cabinet. To mount the clock in this cabinet, follow the same procedure as described in "Rack and Turret Mounting".

Connecting Model 2480 Outputs

All outputs of the Model 2480 Programmer are solid-state DC. No connections(s) should be made to any AC voltage source. Make sure that the operating limits listed in the Specifications are not exceeded. The 5 volt, 100 mA output should be limited to 100 mA maximum current drain. If the current requirements exceed 100 mA, an auxiliary power supply providing output greater than 100 mA and voltage less than 32 Vdc can be used.

If either AC or heavier DC drive is needed, use the Rauland Model 2418 AC (VP0030) Output Buffer Module (KI-1386) or Model 2419 DC (VP0031) Output Buffer Module (KI-1387). Do not use a master-slave combination of electro-mechanical relays. If an inductive load is switched using the Model 2480 Programmer, make sure that arc suppression is used (Figure 6).

Refer to KM-0678 for Model 2480 Programmer Wiring in School Sound Systems and Telecenter Systems.

**** CAUTION: DO NOT CONNECT ANY AC VOLTAGE SOURCE DIRECTLY TO THE OUTPUTS OF THE MODEL 2480 PROGRAMMER. REFER TO THE APPROPRIATE WIRING DIAGRAMS.**

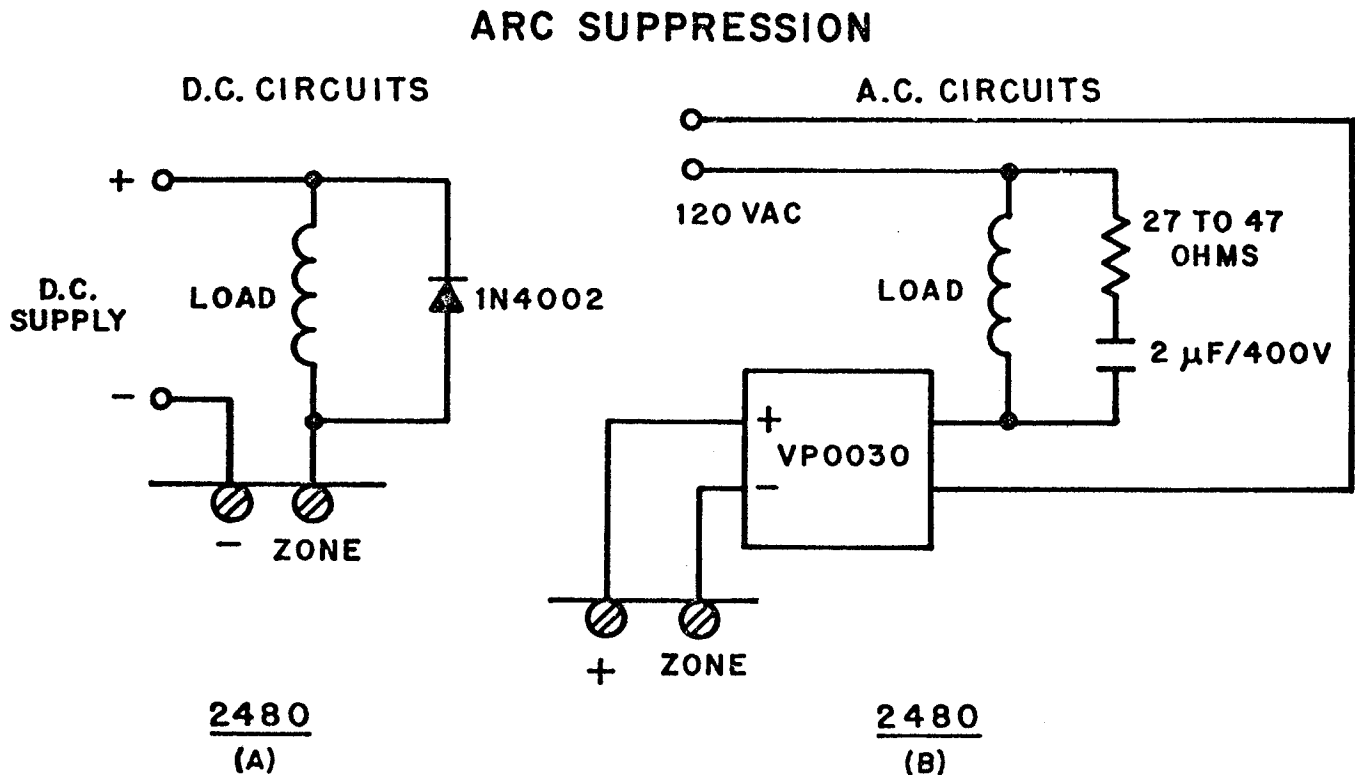


Figure 6. Arc Suppression Circuits

OPERATION

GENERAL

Operation consists of applying power to the Model 2480 Programmer choosing the 12- or 24-hour format, setting the time in the PROGRAM mode, loading information from the Event Program Chart and placing the unit in the RUN mode.

PROGRAMMING (Modes 1, 2, 3, 4 and 5)

Applying Power

CAUTION: IF A BATTERY BACK-UP MODULE (Model 2454) IS INSTALLED WITH THE PROGRAMMER, APPLY AC POWER FIRST AND THEN CONNECT BATTERY.

After the unit has been installed, insert the key in the lockable key switch and turn the switch to the RUN position. The Programmer derives power from a 120 ac volt outlet; connect the power cord to apply power. When power is first applied the display will flash (after an initial delay of 5-10 seconds), indicating there has been a loss of power. The number "6" should display in the MODE LED. In the TIME LED, 12:00 AM will be displayed if the 12-hour format was selected or 00:00 if the 24-hour format was selected. Turn the KEY switch to the PROGRAM position. The display should stop flashing and the number "1" should be displayed in the MODE LED. ZONE LEDs should be off.

Selecting 12- or 24-Hour Format

To select either a 12- or 24-hour format, push and hold depressed the ZONE 1 pushbutton switch. With the ZONE 1 switch depressed, push the ENTER switch. Each time the ENTER switch is pushed, the alternate format should be displayed (12:00 for 12-hour operation, or 00:00 for 24-hour operation).

NOTE: The following discussion assumes the 12-hour format. The AM/PM LEDs will remain off when in the 24-hour format.

Setting Present Time (Mode 1)

Using FWD (Forward) and REV (Reverse) pushbuttons, set the present time of day. When either one of these pushbuttons are pushed and released rapidly (quick stroke and even timing), they will increment or decrement minutes by one. If either pushbutton is held depressed for more than one second, it will increment or decrement hours. At the first depression of the FWD or REV pushbuttons, the ENTER LED will start flashing. The flashing ENTER LED indicates that this changed information should be entered into the Programmer's memory by pushing the ENTER pushbutton. When the ENTER pushbutton is pushed, seconds are set to zero in the unit. Set the time one minute ahead of the present time; at exactly "0" seconds, push ENTER. The ENTER LED should stop flashing and the DAY Mode 2 will automatically be displayed on the MODE LED.

Daylight Saving Time Changes

Resetting the Programmer for daylight saving time only requires that the time be set to the new hour in the TIME mode. (Refer to "Setting Present Time (Mode 1)").

Setting Present Day (Mode 2)

When the DAYS Mode is selected, AM and PM LEDs will turn off. The DAYS display uses only the rightmost digit of the TIME display. Single step the FWD or REV switches to numerically display the present day of the week. For example, display "4" for Thursday. With the first push of FWD or REV push-buttons, the ENTER LED will start flashing. When the display is showing the present day, push ENTER to load the present day into the memory. This will turn off the flashing ENTER LED and the MODE will automatically change to "3" showing that the Programmer is now in the LOAD MODE.

Note: It is recommended that the Event Program Chart be completed before starting to program in the events. (Refer to Figure 5 for Typical Entries on this Chart.)

Programming Events (Mode 3)

The ZONE switches have a flip-flop action, meaning that if their corresponding LEDs are off, they will turn on. If the corresponding LEDs are on and the switches are pushed, the LEDs will turn off.

When LOAD (Mode 3) is selected, the TIME display, including the AM and PM LEDs should display the present time of day. Referring to the Event Program Chart (Figure 5), select the first event to be programmed. Using FWD or REV switches on the clock, set the time display to show the time of the event. Then, using the eight ZONE switches, select and push the appropriate ZONE switches programmed for that event. ZONE information can be programmed in any sequence. When a zone has been selected for an event, the corresponding zone LED will light.

Whenever any element (TIME or ZONE) is changed by pushing the associated switches, the ENTER LED will start flashing and will keep flashing until the ENTER switch is pushed to store that event. The event would be stored as it was displayed, at that time, in memory. When the ENTER switch is pushed, the ENTER LED will turn off showing that the event has been programmed and the clock is ready to accept a new event. Since all events should have at least one zone, the Programmer will not allow entering an event which does not satisfy this condition. Using the programming procedure just described, enter all the events in the unit's memory using the Event Program Chart.

Note: Since an event to occur at a specific time is stored in a corresponding location, only one combination of zones can be programmed with one time data.

Reviewing Programmed Events (Mode 4)

Select EDIT (Mode 4) by using the MODE pushbutton. Each time the MODE pushbutton is depressed, it will increment the mode by one only when the lockable key switch is in the PROGRAM position. Operation of this pushbutton will change the MODE from 1 (TIME Mode) to 5 (SELECT Mode). It will change from MODE 5 (SELECT) to MODE 1 (TIME) and cycle through these Modes. Single step the MODE pushbutton switch until EDIT "Mode 4" is selected. The first event after midnight (12:00 AM or 00:00) should be displayed.

The EDIT Mode allows events stored in memory to be sequentially reviewed, modified, or deleted. When FWD is pushed, the next event in chronological order will be displayed. When REV is pushed, the previous event in chronological order will be displayed.

Use the FWD and/or REV pushbuttons to cycle through and review the programmed events. If the FWD or REV pushbuttons are held depressed, the events will be scanned at a rate of two (2) events per second. The Programmer will always display 12:00 AM time. If there is no event at midnight, the Programmer will continue to display midnight time with ZONE LEDs extinguished.

Editing of Events (Mode 4)

In the EDIT Mode, the ZONE information of any event could be changed. To change the information, push the corresponding switches to display the correct ZONE LEDs. As soon as the first change is made, the ENTER LED will start flashing. When the correct information has been displayed, push ENTER to store this change in the Programmer memory. To erase an event, zero out Zone information (that is, use the ZONE switches to turn any lighted ZONE LEDs off) and push ENTER.

Selecting Zones (Mode 5)

Push the MODE switch to display SELECT (Mode 5). This is an override function. Upon execution, only programmed and selected Zones will be activated. The TIME display and both AM and PM LEDs should be extinguished. To select a combination of ZONE(S) depress the corresponding pushbuttons and visually check the related LEDs. When the ZONE information is correctly displayed, push the ENTER switch.

Selecting Run Mode (Mode 6)

Place the clock in the RUN Mode by turning the key switch to the RUN position. Mode 6 should be displayed in the MODE LED. The current time of day will be displayed in the TIME display. The ENTER LED should be off. In normal operation, the six modes described will be used.

Display in Run Mode

When in the RUN Mode, the MODE display will show "6" and the TIME display will show the current time of the day unless programmed for expander use (See Table 11. Types of Operation in Mode 9). The ENTER LED should be off. The zone LEDs on the front panel will show the activated output status of all eight zones.

"RUN MODE"

When the key switch is turned to the "RUN" position, the programming functions are disabled. Instead, the pushbutton switches that have green lettering will now perform the special functions described here.

"MANUAL" Activation of Zones

Note: The manual activating functions can be disabled to prevent tampering-- see "Programming in Mode 9" in the next section, "SPECIAL PROGRAMMING."

You can manually activate any zone by holding in the MANUAL button and then pressing and releasing the appropriate "ZONE" button. As soon as you press the "ZONE" button, a signal will be sent out from the corresponding zone; however, the LED indicator on the front panel will not light up until you release its button. You can activate all eight zones, provided that you turn them on one at a time and release one "ZONE" button before pressing the next one.

Momentary Zones will stay on so long as you hold the MANUAL button. Once you release this button, you can turn the Momentary zones off again by pushing and releasing any pushbutton except ENTER/MANUAL. If you do not turn off the Momentary Zones, they will automatically turn off within a minute. (A 15-second zone will turn off at 15 seconds past the beginning of a minute; a 40-second zone, at 40 seconds past; etc. Thus, if you were to release the MANUAL button at 11:20 and 30 seconds, the 40-second zone would turn off 10 seconds later, but the 15-second zone would remain on until 15 seconds after 11:21.)

Toggle Zones continue their "On-Off" mode of operation even in the manual mode. Each time that you hold down the MANUAL button and push the button of a "Toggle Zone," you will change the output from "Off" to "On" (or vice versa). Whether or not you continue pressing the MANUAL button, the "Toggle" zone will remain the way you last set it until you change it again or a programmed event does.

Displaying the "DAY" of the Week

Hold in the DAY button to see what day of the week it is: the day is shown as a single digit in the "TIME" display (an explanatory chart is printed on the front panel to the right of the "TIME" display). Releasing the button will return you to the normal time display.

THE PREVIEWING MODES ("NEXT" AND "TEST"):

General Principles

These two modes enable you to see when an event will actually take place on the day that the programmer is currently set for (Mode 2). Remember, for an event to actually occur, three programming conditions must be met:

- (1) A time of day and one or more zones must have been entered via "LOAD" (Mode 3) or "EDIT" (Mode 4).
- (2) The desired zones must be programmed in "SELECT" (Mode 5).
- (3) The desired zones must be programmed in Mode 7 to operate during the current day.

If any one of these conditions is not satisfied, the event will not be executed and, consequently, it will not be shown in the "NEXT" or "TEST" mode.

If no events are to take place during the current day or if the last event for that day has already been passed, the preview modes will show "12:00 AM." A second push of the TEST button will then show the first event (if any) of the day.

Previewing the "NEXT" Event

Holding in the NEXT button causes the "TIME" display to show when the next event will occur. It also lights up the LED indicators of the zones that will activate during the event, and turns off the indicators of any other zones that might be active currently (however, the zone outputs will continue operating as usual). Releasing the button returns you to the normal display.

To "TEST" Events

The "NEXT" function lets you view the setting for the event that will occur next; the "TEST" function lets you view and manually operate any event that will actually occur that day.

To View Events, press and release the TEST button. This will (1) cause the "TIME" display to show when the next event is to occur, (2) light up the LED indicators of all the zones that are to activate during the event, (3) turn off the indicators of any other zones that are currently operating (without affecting their actual operations), and (4) cause all the LEDs to flash continuously.

Each time that you press the TEST button, the system will advance to the next event for that day; once you have viewed them all, the system will begin running through them again (including any set for an earlier hour of the day). To view the events programmed for a different day, change to the desired day in "MODE 2."

To Test an Event, bring it onto the display with the TEST button, then hold in the MANUAL button: the affected zones will operate until you release the button (of course, a "Toggle" zone may be turned "Off" by the tested event).

To Leave the "TEST" Mode, momentarily depress one of the following buttons: DAY, NEXT, or FUNC ("Function").

Notes:

1. The "TEST" mode can affect current events in two ways:
 - A. While the system is in the "TEST" mode, it will not respond to current programmed events.
 - B. When you manually activate a "TEST" event, you will turn off any "Toggle" zone that is active. When you have finished testing, you will have to turn the affected "Toggle" zones back on manually.
2. This manual-activating function can be disabled to prevent tampering-- see "Programming in Mode 9" in the next section, "SPECIAL PROGRAMMING."

Using the "FUNC" ("Function") Button

Holding in this button will show which zones are programmed to function as "Toggle" zones. The "TIME" display will show "00," and the LED indicator of each zone with this setting will light up (if no zones have been programmed for toggling, no LED indicators will light up).

SPECIAL PROGRAMMING

GENERAL

Programming steps in Modes 7, 8 and 9 should be performed as part of the installation. In many applications, programming in Modes 7, 8 and 9 may not be required. Bulk Programming, Bulk Erasing and Clearing of Memory are special functions which can be used to make programming more convenient. Before programming in Modes 7 and 8, fill out the Day/Zone and Duration Program Charts.

Day/Zone Program Chart

The Programmer is factory shipped to execute events on all eight (8) zones, Monday through Friday (Figure 7). This means that if an event is programmed for Zones 1 and 2 at 8:00 AM, then Zones 1 and 2 will execute daily Monday through Friday. No events will execute on Saturday and Sunday.

DAY / ZONE PROGRAM

DAY	DAY NO.	ZONE							
		1	2	3	4	5	6	7	8
MON.	1	✓	✓	✓	✓	✓	✓	✓	✓
TUE.	2	✓	✓	✓	✓	✓	✓	✓	✓
WED.	3	✓	✓	✓	✓	✓	✓	✓	✓
THU.	4	✓	✓	✓	✓	✓	✓	✓	✓
FRI.	5	✓	✓	✓	✓	✓	✓	✓	✓
SAT.	6								
SUN.	7								

NOTE: Zones 1, 2, 3, 4, 5, 6, 7 and 8 are inactive on Saturday and Sunday.

Figure 7. Entries on Day/Zone Program Chart as Shipped from the Factory.

If other combinations of Day/Zone are required, refer to the following text on typical entries as shown.

DAY.....This column identifies the day of the week.

DAY NO....This column numerically identifies the day of the week.

ZONE.....Eight subcolumns are provided under ZONE which correspond to the eight customer-selected zones. Enter a checkmark in the subcolumn for each zone (or zones) in which the event is to occur that corresponds to the day of the week (Figure 8).

DAY/ZONE PROGRAM

DAY	DAY NO.	ZONE							
		1	2	3	4	5	6	7	8
MON.	1	✓	✓		✓			✓	✓
TUE.	2	✓	✓		✓			✓	✓
WED.	3	✓	✓		✓	✓	✓	✓	✓
THU.	4	✓	✓		✓			✓	✓
FRI.	5	✓	✓	✓	✓			✓	✓
SAT.	6				✓	✓	✓	✓	✓
SUN.	7				✓	✓	✓	✓	✓

Figure 8. Typical Entries on the Day/Zone Program Chart that may be required by the Customer.

Duration Program Chart

The Programmer is factory shipped with a duration of 3 seconds for each zone (figure 9).

DURATION PROGRAM

ZONE	DURATION	DESCRIPTION	ZONE	DURATION	DESCRIPTION
1	03	ANY AREA	5	03	ANY AREA
2	03	ANY AREA	6	03	ANY AREA
3	03	ANY AREA	7	03	ANY AREA
4	03	ANY AREA	8	03	ANY AREA

(NEW DURATION CHART SHOWING 8 ZONES)

Figure 9. Entries on Duration Program Chart as Shipped from the Factory.

If a different duration is required for a particular zone(s), refer to the following text and typical entries as shown in Figure 9.

ZONE.....This column corresponds to the eight customer-selected zones.

DURATION...This column provides for the length of time a ZONE is enabled. The duration has a range from "01" to "59" seconds. The duration is factory preset at "03" seconds (Figure 9). Each zone can be set to the desired duration within the specified range. A duration of "00" indicates that a zone will toggle ON/OFF. The zones with zero duration are referred to as Toggle zones in the manual. For each zone, write in the appropriate duration.

NOTE: Toggle zones are used to keep devices on for any number of minutes by programming the zone(s) on at a specific time and then by turning them off at another time. All operations should be programmed to turn on at even minutes and turn off at odd minutes.

DESCRIPTION...Provides for the description of the devices/area of a zone.

DURATION PROGRAM

ZONE	DURATION	DESCRIPTION	ZONE	DURATION	DESCRIPTION
1	02	LIBRARY	5	07	SHOP
2	05	INSIDE BELLS	6	08	GYMNASIUM
3	10	ATHLETIC STADIUM	7	00	OUTSIDE LIGHTS
4	12	OUTSIDE BELLS	8	00	HVAC UNIT

Figure 10. Typical Entries on the Duration Program Chart that may be required by the Customer.

Preparation for Special Programming

Reference may be made to various subsections of the Manual for information on changing the MODE(S) of the Programmer.

Insert the key into the lockable key switch and turn to the PROGRAM position. Change the Mode to "5". Push and hold the MODE switch (which will display Mode 1) and push ENTER. The mode display should show MODE 7. The MODE switch is then used to single step through MODES 7, 8 and 9.

Setting Zones for the Day of the Week (Mode 7)

Referring to the DAY/ZONE PROGRAM CHART (Figure 8) and with MODE 7 selected, the rightmost digit of the TIME display will show the day of the week. For example, a "1" should be displayed for Monday, a "2" for a Tuesday, and so on. Using the FWD and REV pushbuttons, cycle through the DAYS of the week. The ZONE switches are enabled. Different ZONE combinations can be obtained for different DAYS of the week. When a change is made in zones for any day, the ENTER LED will start flashing. Push the ENTER switch to store the information in the Programmer's memory. Select another DAY of the week and continue this procedure until all seven days have been entered or checked.

Duration for Each Zone (Mode 8)

To advance from MODE 7 to MODE 8, press and release the MODE pushbutton switch. Refer to the typical example of a DURATION PROGRAM CHART (Figure 9) and set the duration for each zone. When MODE 8 is selected, the two right-most digits of the TIME display will show "03" (3 seconds). This indicates that the duration (time) was set to (3) seconds to enable a particular zone. The ZONE 1 LED should be illuminated. These conditions, duration of three seconds and ZONE 1 LED illuminated, are preset at the factory. The duration can be changed (Figure 9) using the FWD and REV pushbuttons within a range of "01" to "59." After a change has been made and the ENTER LED is flashing, push the ENTER pushbutton switch. Next, push the ZONE 2 switch and set the duration for that zone. Using this procedure, the duration for all eight ZONES can be entered. Entering a zero will program a Toggle zone.

Programming in Mode 9

Mode 9 gives you the options of blanking out the "TIME" display and of disabling the manual operations. Typically, you would want to blank the "TIME" display when the 2480 is used as an expander unit and is installed next to the master clock; you would want to disable the manual operations if you were concerned about tampering.

Note that Mode 9 does not affect the 2480's functioning as an expander or stand-alone unit; that determination is controlled by the wiring (see "Using the 2480 Programmer as an Expander," which follows). Figure 11 suggests "typical applications" for each Mode-9 setting; however, any of the settings can be used for either "expander" or "stand-alone" operations.

<u>Code</u>	<u>Typical Application</u>	<u>Time Display</u>	<u>Manual Zone</u>
00	stand-alone	on	enabled
01	expander	blanked	enabled
02	stand-alone	on	disabled
03	expander	blanked	disabled

Figure 11. Types of Operation in Mode 9.

The Programmer comes from the factory pre-programmed with Code "00" in Mode 9. Unless it has a battery backup, whenever the 2480 is turned off, it reverts back to this setting so that users will not have the manual control accidentally disabled.

Pushbutton Operation when the Manual Controls are Disabled

When the manual controls are disabled (Mode-9 "02" or "03"), the "view" pushbuttons still function as follows:

- DAY: Hold in to display the day of the week.
- NEXT: Hold in to display the next event.
- TEST: Push in and release to view the next event. Repeat to view subsequent events in sequence. The display will continue flashing while you are in this mode. Push and release the DAY, NEXT, or FUNC key to return to the normal display.
- FUNC: Hold in to display the "Toggle" zones.
- MANUAL: This will not activate an individual zone or an event brought onto the display by the TEST pushbutton. To regain this control, change the Mode-9 setting to "00" or "01."

Using the 2480 Programmer as an Expander

The 2480 can be used as an eight-zone "expander" (or "slave") for Rauland Master Clock Models 2450, 2424NU, and 2424WN (provided that the 2424 clocks are equipped with a 24-hour EPROM set).

When used as an expander, the 2480's time is automatically synchronized once a day by the master clock. In most other respects, the 2480 operates the same way in the expander mode as it does in the stand-alone mode--notably, it continues to control all of its zone signals.

To use the 2480 as an expander, wire it to a Rauland 2400 Series Master Clock as shown in IL-0201.

Note: You should not use a battery backup with the 2480 when it is used as an expander.

Bulk Programming

This provides a convenient way to have a series of events programmed at one event each minute. Enter Mode 3 and set the time at which your first event is to occur (for example, "10:00 AM"). Set the required zone on. Push and hold ENTER and at the same time push and hold FWD. This will make the Programmer step minutes as the zone is programmed for a new time. Release the switches when the unit displays "10:19 AM." Now you have programmed 20 events which will activate a zone each minute. This procedure may be used substituting the REV switch for the FWD switch.

Bulk Erasing

This provides a fast way of erasing all programming from a given block of time. For example, to erase events from 8:00 AM to 8:29 AM, enter MODE 3, set the time to 7:59 AM, and turn off all the zones. Then hold in ENTER while you push FWD. The display will step to 8:00 AM and keep stepping and erasing events from 8:00 AM. Release the switches when the "TIME" display shows "8:29 AM." This can also be done going backwards, using the REV pushbutton instead of the FWD one.

Clearing the Memory

All the events in the 2480's memory can be erased by first turning off its AC power (and disconnecting the cabling from the battery, if a battery backup has been installed). Place the key switch in the "PROGRAM" Mode. Push and hold the ENTER button, turn the AC power back on, then release the ENTER button. The displays will remain blank for 60 to 90 seconds. When the displays light up again, the 2480 will be in the 12-Hour Mode and all the programmed events will have been erased. This does not affect programming done in Mode 7, 8, or 9.

CAUTION: APPLY AC POWER TO THE MODEL 2480 PROGRAMMER BEFORE CONNECTING THE CABLE TO THE BATTERY TERMINALS WHEN THE MODEL 2454 BATTERY BACK-UP KIT IS USED.

RESETTING THE 2480 AFTER A POWER FAILURE

Note: The following descriptions assume that the key switch is in the normal, or "RUN," position.

(1) As a Stand-alone WITHOUT a Battery Backup

The "MODE" display will show a "6," and the "TIME" display, "12:00 AM"; both will continue flashing. No zones will be on. However, as the "6" on the "MODE" display indicates, the 2480 immediately begins running and will execute programmed events starting with 12:01 AM.

To restore normal operations, set the correct time and day, manually turn on any "Toggle" zones that should be active, and change the Mode-9 setting if necessary (without a battery backup, the 2480 automatically reverts to "00" in this mode after an AC power interruption).

(2) As a Stand-alone WITH a Battery Backup

If equipped with Rauland's 2454 battery backup kit, the 2480 will keep track of the time and the programmed events, although it will still blank out its displays and stop operating its zones.

When the AC power has been restored, the MODE display will flash a "6," the "TIME" display will flash the current time (unless the 2480 is programmed to blank this display), and the programmed events will be executed at the proper times. However, to prevent too many external devices from turning on simultaneously (and possibly overloading the building's electrical system with their combined power surges), the 2480 will restart the "Toggle" zones at one-minute intervals.

The flashing display alerts you to the power interruption. The battery backup will keep the time to within a few seconds' accuracy. If you don't want to reset the time, simply turn the key switch to "PROGRAM" and back to "RUN": this will restore the normal display.

If you want to enter the precise time, turn the key switch to "PROGRAM" and correct the time. When you turn the key switch back to "RUN," the normal display will be restored. Since entering a new time or day will turn off any active "Toggle" events, you will have to restart them manually.

(3) As an Expander for a Clock WITHOUT a Battery Backup

When AC power has been restored, the 2480 will be reset to 12:01 AM, and the "Toggle" zones will be off. You can reset the 2480 manually, just as if it were in the stand-alone mode. However, as soon as the master clock is reset, it will automatically reset the 2480, so it is advisable to reset the master clock and let it reset the 2480.

While being reset by the master clock, the 2480 will flash a "2" in the "MODE" display and blank its "TIME" display. After its time has been reset, the 2480 will flash a "1" in the "TIME" display (after a power interruption, the 2480 reverts to the first day of the week).

You can set the proper day without touching the key switch: use the FWD and REV buttons to bring up the correct number, then push and release the ENTER button. This will enter the "DAY" setting, change the "MODE" display to a "6," and restore the time to the "TIME" display. However, if you also need to change the Mode-9 setting or turn on a "Toggle" zone, you will have to use the key switch and go through the applicable procedures.

Note: The initial resetting of the time will be synchronized to within a minute of the master clock's; the precise resetting will take place at the usual correction time.

(4) As an Expander for a Clock WITH a Battery Backup

When AC power is restored to the master clock, it will automatically begin resetting the time on the 2480, which will signal this activity with a "2" on the "MODE" display and a blank "TIME" display. When the time has been reset, a day of the week will flash in the "TIME" display (a "1" if the 2480's AC power has been interrupted). At this point, the 2480 will have all of its zones turned off and will begin keeping time and executing whatever programmed events come next.

You can reset the "DAY" setting by using the FWD and REV buttons, then pressing and releasing the ENTER button. This will restore the normal display. If you also need to restore a Mode-9 setting or restart any "Toggle" zones, turn the key switch to "PROGRAM" and follow the appropriate procedures. Turning the key switch back to "RUN" will restore the normal display.

Note: The master clock sends out its time-correction signal as soon as its AC power has been restored. If the 2480 does not have AC power at this time, it cannot, of course, respond to the correction signals. If this happens, you should reset the 2480's time manually; otherwise, it will start from the "12:00 AM" setting whenever its AC power is restored and will be reset at the usual correction time.

ABBREVIATED OPERATING INSTRUCTIONS

To Program:

Place the key switch in the "PROGRAM" position and proceed as follows:

To Set the Present Time:

In the "TIME" Mode (1), using the FWD and REV pushbuttons, set the "TIME" display one minute ahead of the present time. At precisely "zero seconds," push ENTER.

To Set the Present Day:

In the "DAY" Mode (2), using the FWD or REV pushbuttons, set the "TIME" display for the present day number. Push ENTER.

To Load a New Event:

In the "LOAD" Mode (3), set the "TIME" and "ZONE" displays as desired. Push ENTER.

To Review Events:

In the "EDIT" Mode (4), push the FWD or REV pushbutton to review the programmed events.

To Change or Erase an Event:

Display the event in the "LOAD" Mode (3) or the "EDIT" Mode (4). Make whatever changes you want in the "ZONE" display. Push ENTER.

To Activate Desired Zones:

In the "SELECT" Mode (5), set whatever "ZONES" you want to be active (any zone not entered here will be disabled). Push ENTER.

To Resume Operations after a Power Failure:

When the power has been restored, turn the key switch to stop the displays flashing. If necessary, reset the time, day, and any "Toggle" zones that are supposed to be active (see the previous section, "Resetting the 2480 after a Power Failure").

ABBREVIATED OPERATING INSTRUCTIONS (Continued)

To Run

Place the key switch in the "RUN" position. (The present time and the activated zones will be displayed on the front panel's zone LEDs.)

To Display the Day of the Week

Push DAY (Zone 5).

To Display the Next Zone Activation

Push NEXT (Zone 6).

To Test the Events of the Present Day

Push TEST (Zone 7) to display. Push MANUAL to activate the zones, unless the manual-control function has been disabled. To reset the "TEST" Mode, push DAY, NEXT, or FUNC.

To Display the Zero-Duration ("Toggle") Zones

Push FUNC (Zone 8). The "TIME" display will show "00" and the appropriate zone LEDs will light up.

To Activate Zones Manually (when the Manual-Control Function Is Enabled)

Hold in MANUAL while pushing the designated zone buttons. A zone which has zero duration will be toggled ON/OFF when its button is pushed. The momentary zones (those set for a definite duration) will turn on. To turn off these zones, release the MANUAL button and push any button except ENTER/MANUAL.

To Enable or Disable Manual Zone Control

Refer to the section on "Programming in Mode 9."

PARTS LIST

Note: The following parts list is keyed to KC1535.

<u>Schematic Designation</u>	<u>Description</u>	<u>Rauland Part No.</u>
C1.	Tantalum axial capacitor, 6.8 uF, 15 V.	CTA685
C2, C3, C4, C10, C11, C13, C14, C15, C17, C18, C19, C24, C25, C26.	Ceramic axial capacitor, .1 uF, 50 V.	CCM104
C5.	Ceramic plug-in capacitor, 24 pF, 500 V. ²²	CCP240
C6.	Ceramic plug-in capacitor, 6.8 pF, 500 V.	CCP060
C7, C16.	Tantalum axial capacitor, 1 uF, 25 V.	CTA105
C8.	Tantalum axial capacitor, 2.2 uF, 50 V.	CTA225
C9.	Tantalum axial capacitor, .47 uF, 25 V.	CTA474
C12.	Tantalum axial capacitor, 3.3 uF, 20 V.	CTA335
C20.	Electrolytic capacitor, 2200 uF, 35 V.	CE2-063
C21, C22, C23.	Across-the-line capacitor, .0033 uF, 1400 V.	CCS332
D1, D2.	Diode.	1N457A
D3.	Schottky barrier rectifier.	1N5817
D4.	Zener diode, 3.9 V, 5%.	JR0090-2
D5.	Metal-oxide varistor.	JR0103
D6-D10.	Diode.	1N4002
DIS 1-5.	7-segment LED display, HP HDSP7303.	JL0088
Q1, Q3.	Transistor.	ETMPS6515
Q2.	Integrated circuit, 5-V Voltage Regulator 7805.	EC0112
R1.	Metal-film resistor, 102 ohm, 1/4W, 1%.	RJ0-102AB
R2.	Carbon-film resistor, 1 megohm, 5%.	RE0-105
R3.	Carbon-film resistor, 270 kilohm, 1/4W, 5%.	RE0-274
R4, R5, R36.	Carbon-film resistor, 47 ohm, 1/4W, 5%.	RE0-470
R6, R17, R18, R19, R20, R21, R22, R23, R33.	Carbon-film resistor, 2.2 kilohm, 1/4W, 5%.	RE0-222
R7.	Carbon-film resistor, 3.3 kilohm, 1/4W, 5%.	RE0-332
R8, R27, R31, R49.	Carbon-film resistor, 10 kilohm, 1/4W, 5%.	RE0-103
R9, R48.	Carbon-film resistor, 100 kilohm, 1/4W, 5%.	RE0-104
R10, R11, R12, R13, R14, R15, R16.	Carbon-film resistor, 150 ohm, 1/4W, 5%.	RE0-151
R24.	Wire-wound resistor, .39 ohm, 2W, 1%.	RWOR39A
R25.	Wire-wound resistor, .68 ohm, 2W, 1%.	RW0007A
R26.	Carbon-film resistor, 1 kilohm, 1/4W, 5%.	RE0-102
R28.	Metal-film resistor, 3.65 ohm, 1/4W, 1%.	RJ0-365BB
R29.	Metal-film resistor, 1 kilohm, 1/4W, 1%.	RJ0-100BB
R30, R50.	Resistor, 4.7 kilohm, 1/4W, 10%.	RHO-472

<u>Schematic Designation</u>	<u>Description</u>	<u>Rauland Part No.</u>
R32, R37.	Carbon-film resistor, 100 ohm, 1/2W, 5%.	REO-101
R34, R35, R38, R39, R40, R41, R42, R43, R44, R45, R46, R51.	Carbon-film resistor, 4.7 kilohm, 1/2W, 5%.	REO-472
R47.	Carbon-film resistor, 180 ohm, 1/2W, 5%.	REO-181
TRANSFORMER	Power transformer.	LP0438
U1.	Integrated circuit, I/O expander P8243.	EC0140
U2.	I.C., timer 555-A.	EC0004
U3.	I.C., preprogrammed EEPROM, 2816A (Man. XICOR).	EC0139
U4.	Microcomputer without memory.	EC0251
U5.	I.C., dual 4-bit latch.	EC0044
U6.	I.C., 74C374.	EC0104
U7.	I.C., UDN2982A.	EC0076
U8, U11.	I.C., output buffer ULN2004.	EC0159
U9.	I.C., 16-key encoder 74C922.	EC0110
U10.	I.C., Darlington switch.	EC0075
U12.	I.C., quad-Schmitt trigger 4093.	EC0064
U13.	I.C., pre-programmed EPROM 2480.	ED0121
U14.	I.C., 74HC373.	EC0181
U15.	I.C., quad NAND gate.	EC0082
XTAL	Crystal, 3.579545 megahertz.	JX0069

PARTS WITHOUT A STANDARD DESIGNATION

<u>Qty.</u>	<u>Description</u>	<u>Rauland Part No.</u>
4	#10 "U" nuts for untapped rack-mounting holes.	AB1889
1	Front panel.	AN0973
1	Top cover.	AN0960
1	Green LED panel lamp.	JL0094
10	Red LED panel lamp.	JL0095
1	Triple red lens.	QP0862
1	Power cord.	VW1371
4	#10 x 1/2 hex washer-head thread-forming screw, for rack-mounting the 2450 in non-threaded holes.	WA25
2	#6-32 x 1/4 pan-head stainless-steel machine screw, for mounting the front panel.	WA65
4	#10-32 x 3/8 hex-head SEMS screw, for rack-mounting the 2450 in threaded holes.	WA85
2	#6 stainless-steel flat washer, for mounting the front panel.	WJ0074
11	Black momentary-contact SPST switch.	X0643-1
1	Green momentary-contact SPST switch.	X0643-05
1	Key switch (includes two #E100 keys).	X0655

EVENT PROGRAM CHART-MODEL 2480

11/84
Revised 5/85

EVENT NO.	TIME		AM/PM		ZONES *							
	HRS.	MIN.	AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8

EVENT NO.	TIME		AM/PM		ZONES *							
	HRS.	MIN.	AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8
			AM	PM	1	2	3	4	5	6	7	8

* NOTE: ENTER "✓" FOR "MOMENTARY" ZONE ACTIVATE.
 ENTER "T" FOR TOGGLE ZONE "ON" TIME (WHICH SHOULD BE AN "EVEN" MINUTE).
 ENTER "O" FOR TOGGLE ZONE "OFF" TIME (WHICH SHOULD BE AN "ODD" MINUTE).

EVENT PROGRAM CHART-MODEL 2480

EVENT NO.	TIME		AM/PM		ZONES *								
	HRS.	MINS.	AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	

EVENT NO.	TIME		AM/PM		ZONES *								
	HRS.	MINS.	AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	

* NOTE: ENTER "✓" FOR "MOMENTARY" ZONE ACTIVATE.
 ENTER "T" FOR TOGGLE ZONE "ON" TIME (WHICH SHOULD BE AN "EVEN" MINUTE).
 ENTER "O" FOR TOGGLE ZONE "OFF" TIME (WHICH SHOULD BE AN "ODD" MINUTE).

11/84
 Revised 5/85

EVENT PROGRAM CHART-MODEL 2480

11/84
Revised 5/85

EVENT NO.	TIME		AM/PM		ZONES *								
	HRS.	MINS.	AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	

EVENT NO.	TIME		AM/PM		ZONES *								
	HRS.	MINS.	AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	
			AM	PM	1	2	3	4	5	6	7	8	

* NOTE: ENTER "√" FOR "MOMENTARY" ZONE ACTIVATE.
 ENTER "T" FOR TOGGLE ZONE "ON" TIME (WHICH SHOULD BE AN "EVEN" MINUTE).
 ENTER "O" FOR TOGGLE ZONE "OFF" TIME (WHICH SHOULD BE AN "ODD" MINUTE).

DURATION PROGRAM

ZONE	DURATION	DESCRIPTION
1		
2		
3		
4		

TOGGLE ON/OFF = "00" DURATION

DURATION PROGRAM

ZONE	DURATION	DESCRIPTION
5		
6		
7		
8		

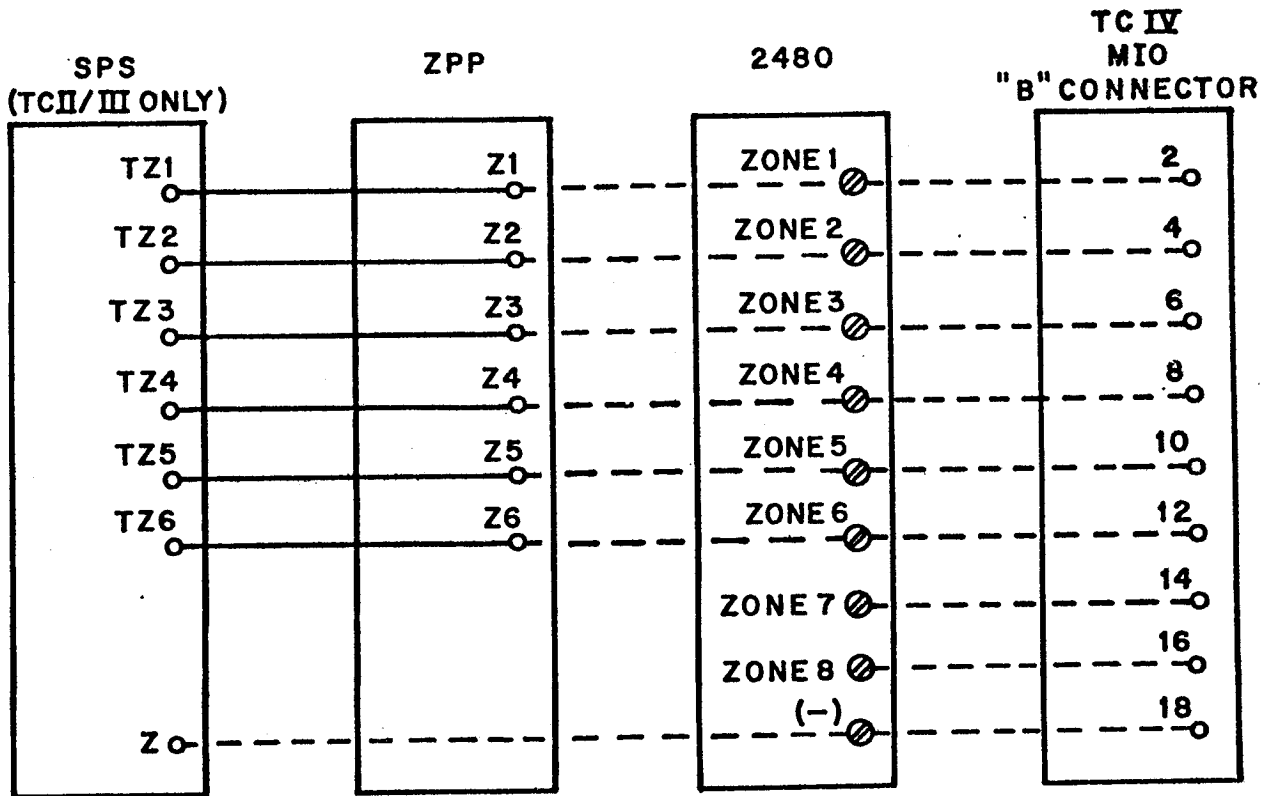
TOGGLE ON/OFF = "00" DURATION

DAY/ZONE PROGRAM

DAY	DAY NO.	ZONE							
		1	2	3	4	5	6	7	8
MON.	1								
TUE.	2								
WED.	3								
THU.	4								
FRI.	5								
SAT.	6								
SUN.	7								

DAY/ZONE PROGRAM

DAY	DAY NO.	ZONE							
		1	2	3	4	5	6	7	8
MON.	1								
TUE.	2								
WED.	3								
THU.	4								
FRI.	5								
SAT.	6								
SUN.	7								



**MODEL 2480
PROGRAMMER WIRING
IN SCHOOL SOUND SYSTEMS AND
TELECENTER SYSTEMS
KM0678-A**

NOTES:

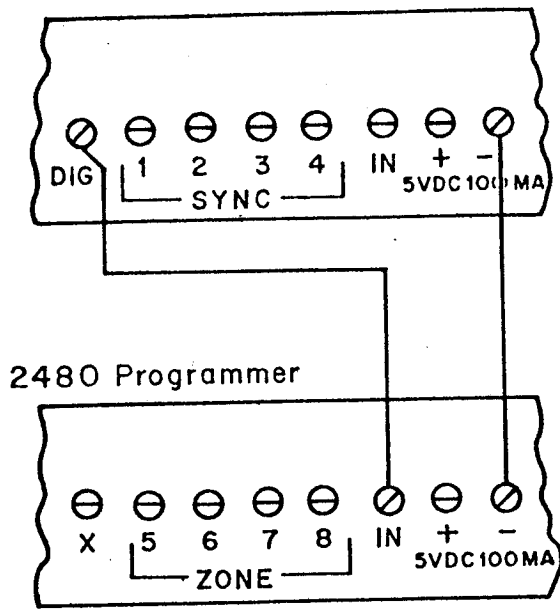
1. SPS = System Power Supply in the Telecenter II or III.

ZPP = Zone Patch Panel (Rauland Model ZPP50/100 or ZPPC50/100). This is used in the Telecenter II and III and other school sound systems.

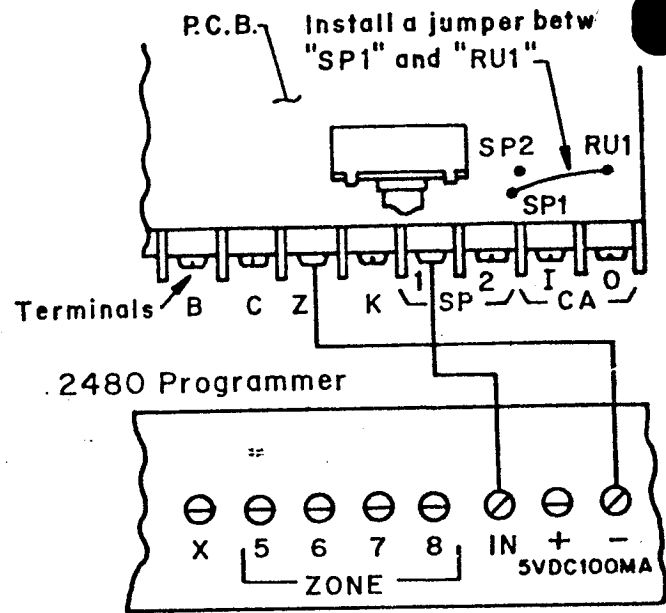
MIO = Main Input/Output board in the Telecenter IV.
2. ZPP terminals are right-angle pins that require the use of a connector (provided with the unit). The SPS and the MIO have wire-wrap terminals. The Model 2480 has screw terminals.
3. 22-AWG tinned cable should be used on all of the connections.
4. When used with the Telecenter IV, the 2480 does not need the Zone Patch Panel (ZPP).

USING THE 2480 AS AN EXPANDER WITH RAULAND MASTER CLOCKS

2450 Master Clock

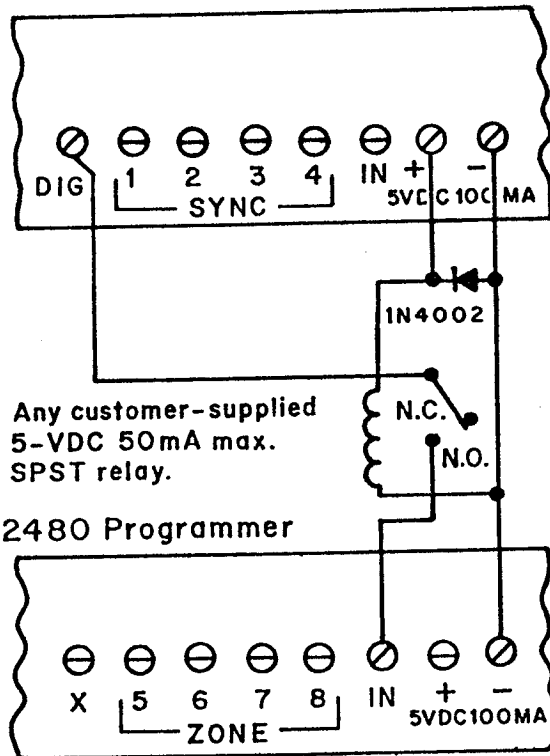


2424NU or 2424WN Master Clock (2424WN shown)

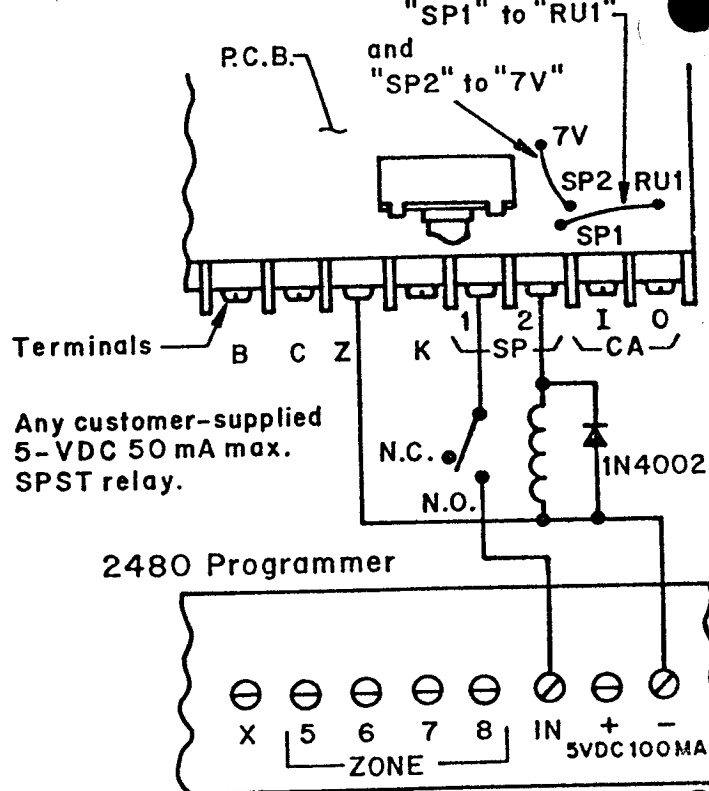


A. Suggested wiring when the master clock and the expander are connected to the same A.C. power source

2450 Master Clock



2424NU or 2424WN Master Clock (2424WN shown)



B. Suggested wiring when the master clock and the expander are connected to different A.C. power sources

ILO201