

**THIS EQUIPMENT COMPLIES WITH FCC CLASS A REQUIREMENTS PURSUANT SUBPART J OF PART 15**

**WARNING:** This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the 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 the interference.

**OPERATION, INSTALLATION,  
AND MAINTENANCE**

**MANUAL**

**LATHEM MASTER CONTROL  
MODELS LTR 2-128, LTR 4-128, LTR 6-128**

**CONTENTS**

Introduction	1
Specifications	1
Schematics:	
Complete Assembly	2
Door Assembly	3
Final Power-Up Procedure	4
Program Instructions	
Preview	4
Mode 1 Set Time	5
Mode 2 Set Day	6
Mode 3 Manual Circuits & Clock Advance	6
Mode 4 Program Circuits	7 - 9
Mode 5 Set Duration	9
Mode 6 Enable Circuits	10
Mode 7 Daylight Saving	10
Wiring Diagrams	
Signal Devices (Bells or Horns)	Appendix A
Secondary Clocks	
F Version EPROM	Appendix A
G Version EPROM	Appendix B
H Version EPROM	Appendix C

LTR 2-128, LTR 4-128 and LTR 6-128 MASTER CONTROLS  
By Lathem Time Co, Atlanta, Georgia.

INTRODUCTION:

These Master Control units consists of two printed circuit boards contained in a flush or surface mount container. All wiring going to secondary equipment (clock, bells, etc.) connect to terminal blocks located inside the back box. The CPU display circuit board is mounted on the door assembly which has a red plexiglas panel front. LEDs visible through the front panel display time, day of week, signal circuit data and user prompting information. Mounted to the front panel is a keypad similar to a telephone keypad which allows for entering, altering or displaying data. A switch located inside the door assembly allows for the prevention of unauthorized data entry.

The timekeeping ability is independent of the power source frequency due to a quartz crystal time base. During A.C. power failures lasting up to 7 days, the unit will continue to function and retain all data. Also during power failures, the unit will flash the colon to indicate standby operation. Upon power resumption, the 6 volt battery automatically recharges with current limited to 1.5 Amperes. A power supply switch, located inside the unit, allows the user to interrupt AC power to all signal devices and secondaries. When this switch is in the OFF position, the unit goes onto standby battery operation displaying a flashing colon.

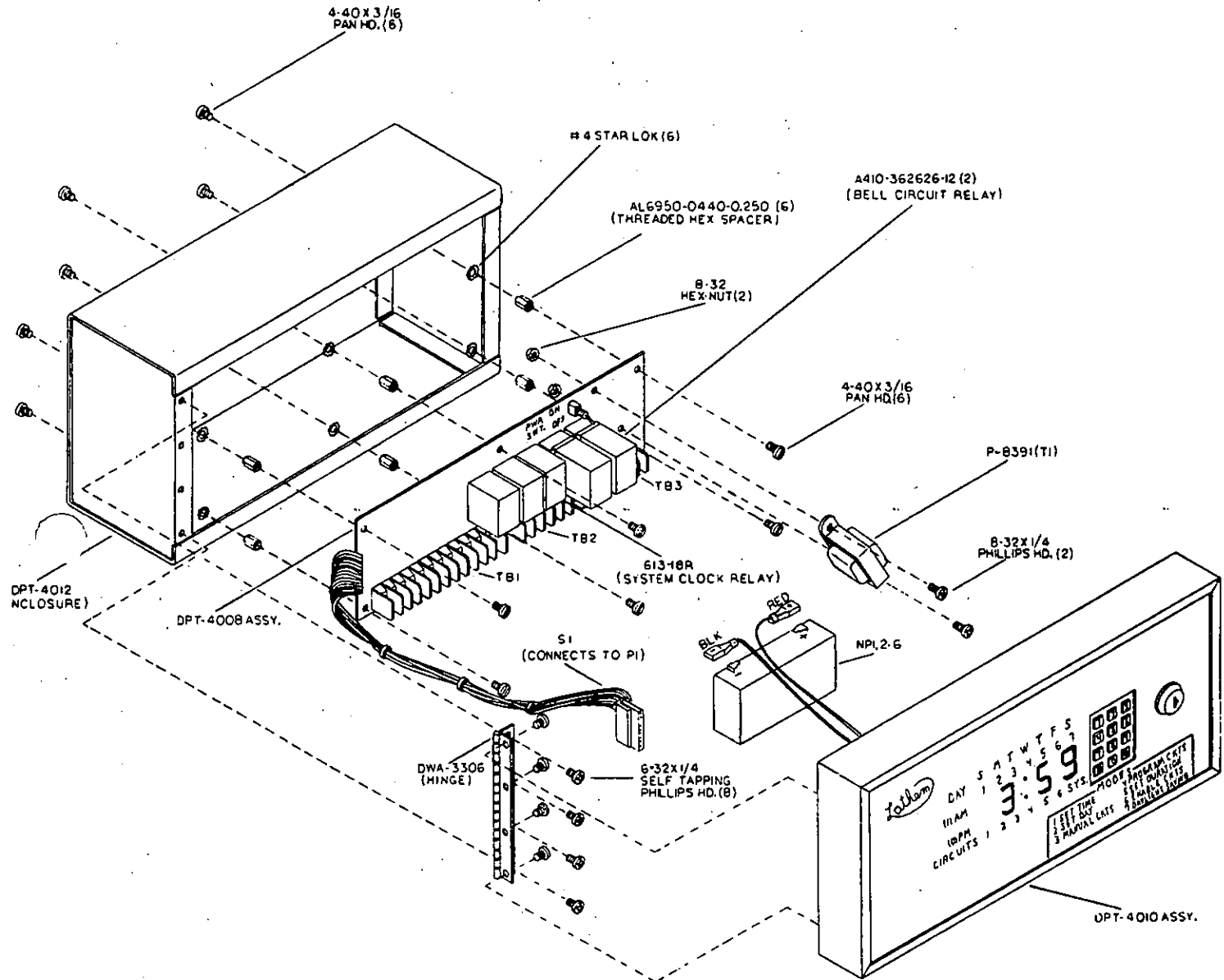
The unit is capable of operating various types of secondaries as described in the appendix section of this manual. Installer selects the type secondary to be operated by entering the two digit code, secondary selection code number corresponding to that type system to be operated. This code is entered one time only, during the power-up procedure. These codes can also be found in the appendix section.

The operation schedule for the two, four or six circuits, held in static RAM, can retain up to 128 entries specifying the time, which day or days of the week, and which circuit or circuits. Circuits can be manually enabled or disabled, each independently. Circuits may be wired parallel and operate as different schedules for the same bells (example Summer, Fall, Winter, etc) or each circuit could signal bells in different areas of the building at different times.

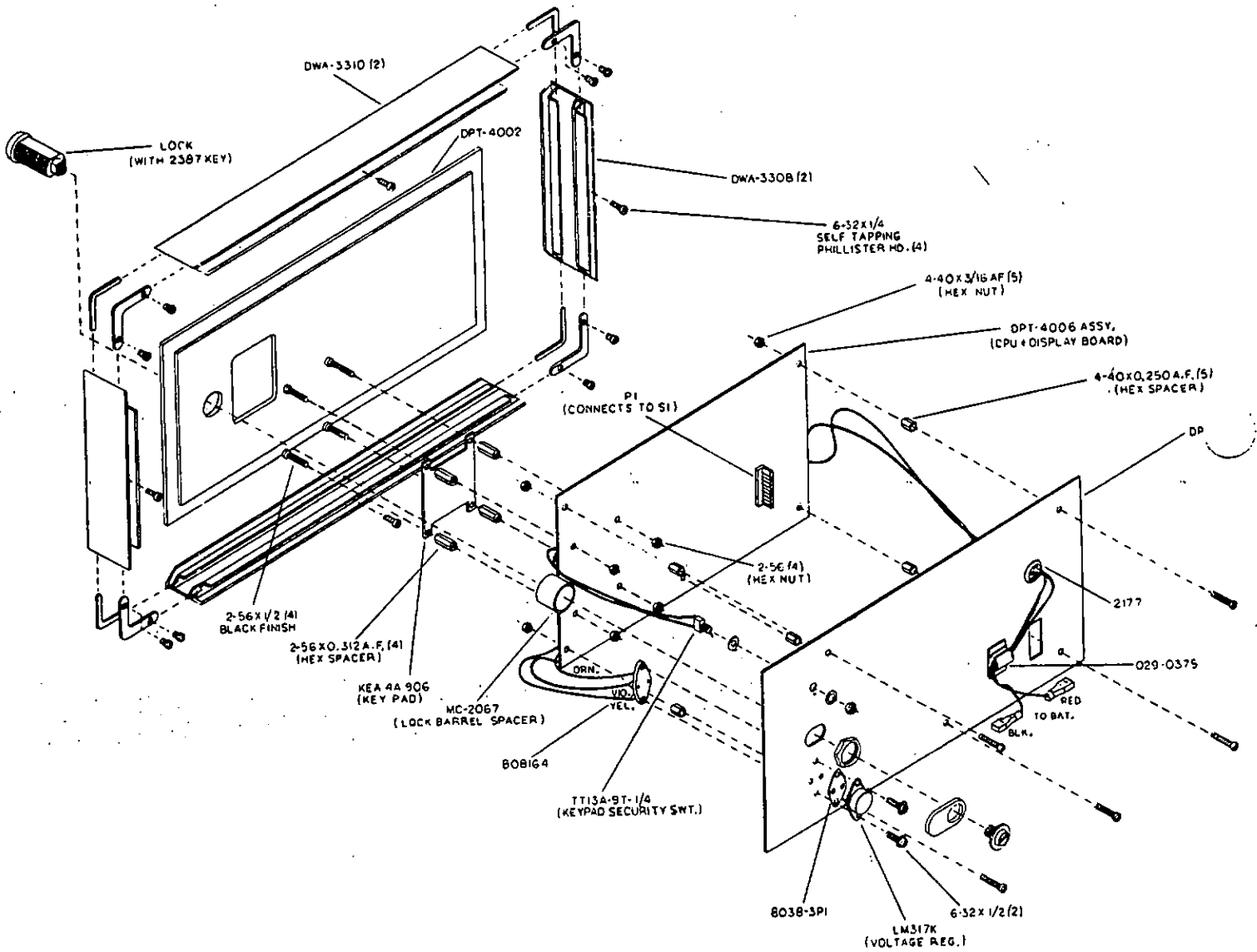
SPECIFICATIONS

Input Voltage	115VAC
Input Frequency	50Hz or 60HZ
Input Power	30 W maximum
Standby Power	1.2Ah, 6 V Gel Cell battery (Automatically recharged)
Standby Time	7 days
Bell Circuits	10A relay contacts
System Clock Circuits	10A relay contacts
Temperature Range	32° - 140°
Voltage Range	+10%
Shipping Weight	12 pounds
Dimensions:	
Surface Mount	13 1/2" w X 6 1/2" h X 5 1/2" d
Semi-Flush Mount	13 1/2" w X 6 1/2" h X 2 1/2" d
Backbox	12" w X 6" h X 4" d

COMPLETE ASSEMBLY OF MODELS LTR 2-128, LTR 4-128, AND LTR 6-128



# DOOR ASSEMBLY FOR MODELS LTR 2-128, LTR 4-128, AND LTR 6-128



## FINAL POWER-UP PROCEDURE:

- (1) Wire according to the diagrams shown in the Appendix section.
- (2) Mate battery connectors (Red to Red, Black to Black)
- (3) Connect power to terminal block TB3 (refer to pages 2 & a-1)
- (4) Set power switch to the ON position
- (5) Set security switch to the OFF position
- (6) Enter the Secondary System Selection Code. Upon setting the power switch to the ON position, "\_0" will be displayed. (NOTE: Except for special models furnished with the G or H version EPROMS. Models with G Version EPROMS will display a "1 \_0" at power-up. Models with H Version EPROMS will display a "2 \_0" at power-up). The \_0 is a prompt for the operator to key in a two digit system selection code listed in one of the appendix sections identifying the type of secondary clocks to be operated. Refer to appendix A for selection codes pertaining to standard models using F Version EPROMS. Refer to appendix B for special selection codes used for models with G version EPROMS. Refer to appendix C for special selection codes used for models with H version EPROMS. Once entered, the code cannot be changed except by setting the power switch to the OFF position and disconnecting the battery connectors to clear all data in memory, then reconnecting and starting again.

## PREVIEW

NOTE: Set security switch, located on the inside of the door, to OFF position. The following sequence of key entries selects the desired mode:

- |        |                  |  |
|--------|------------------|--|
| STEP 1 | PRESS (#)        | Pressing the (#) key addresses the microprocessor and obtains a menu screen of the modes available.  |
| STEP 2 | SELECT (1) - (7) | Press one of the following numbered keys to select the desired mode:<br><br>(1) SET TIME<br>(2) SET DAY<br>(3) MANUAL CIRCUITS (Also Manual Clock Advance)<br>(4) PROGRAM CIRCUITS<br>(5) SET DURATION<br>(6) ENABLE CIRCUITS<br>(7) DAYLIGHT SAVING |
| STEP 3 | PRESS (#)        | Pressing the (#) key enters the user into the mode selected.   |
| NOTE:  | ABORT KEY (*)    | Pressing the (*) key at any time during the course of programming will abort the current instructions, and normal time will be displayed.  |

REFER TO INSTRUCTIONS ON FOLLOWING PAGES FOR THE MODE SELECTED.

**MODE 1****SET TIME**

Security switch must be OFF to access.

This mode will allow the altering of the time display. The user must enter hours, minutes and AM/PM. Seconds are set to zero upon final entry. At initial power-up, the time initializes to 11:11AM and days initialize to a non-select condition.

The key sequence is as follows:

- |                         |   |
|-------------------------|---|
| Step 1. Press (#)       | Request menu screen.  |
| Step 2. Press (1)       | Select <u>SET TIME</u> Mode 1.  |
| Step 3. Press (#)       | Enter mode selected in step 2. The screen will display a cursor followed by three zeros ( <u>0</u> :00), while the AM/PM indicator is blanked and the colon is fixed.   |
| Step 4. Enter Time      | Enter all four digits of the current time (hour and minute) entering leading zeros. If the time is less than 10:00, enter (0) at the first digit [Example: at 9:30 enter (0) (9) (3) (0)]. Enter each digit noting the cursor's position marking the next digit to be entered until all four digits have been entered. At this time the AM/PM indicators will illuminate. |
| Step 5. Select AM or PM | Actuation of (0) will select PM and extinguish AM indicator. Actuation of a (1) will select AM and extinguish the PM indicator. Failure to select AM or PM will cause the unit to set AM.   |

**IMPORTANT**

NOTE: Check to be sure that the correct time is displayed before continuing, if not, press any numeric key and continue at step 4 above. Aborting Set Time mode without entering new data can be accomplished by pressing the (\*) key before continuing to step 6.

- |                   |   |
|-------------------|---|
| Step 6. Press (#) | Actuation of the (#) key enters the new time at zero seconds. The screen will display the new time and blink the colon ':' (at 1 Hz rate) located between the hour and minute display. If an abort (*) is pressed before the entry (#) key is pressed, the clock will not accept the new entry but instead return to the previously set time. |
|-------------------|---|

**EXAMPLE:** To set the time to 2:45PM press the following key sequence:

Press \* to be sure normal time is displayed.

# 1 # 0 2 4 5 0 #

MODE 2      SET DAY      Security Switch must be OFF to access.

This mode is used to enter the day of the week. This indication is made with the use of seven LEDs above the time display. Each LED represents a day of the week, Sunday (1) through Saturday (7). No day is selected during initial power up. A day must be input in order for the programmed bells to occur. The key sequence is as follows:

- Step 1. Press (#)      Request menu screen.
- Step 2. Press (2)      Select SET DAY Mode 2.
- Step 3. Press (#)      Enter mode selected in step 2. This will light all seven indicators showing the days of the week Sunday (1) through Saturday (7).
- Step 4. Select (1) to (7) Any key entry of (1) to (7) will result in the illumination of the corresponding LED while the other six will be extinguished. A key entry of (8), (9), or (0) will result in the illumination of all seven LEDs for the purpose of re-entry.
- Step 5. Press (#)      The (#) key is the terminator entering the new data (day of week) into memory. The operation will automatically revert to normal time display and illuminate the day LED selected above.

EXAMPLE: To set clock day to Tuesday: \* # 2 # 3 #

MODE 3      MANUAL CIRCUITS

This is the only mode that can be entered while the security switch is in the ON position and allows circuits to be manually activated at unscheduled times. The key sequence is as follows:

- Step 1. Press (#)      Request menu screen.
- Step 2. Press (3)      Select MANUAL CIRCUITS Mode 3.
- Step 3. Press (#)      Enters mode 3 causing only the circuit LED'S located below the time display to illuminate.
- Step 4. Select (1) to (7) This step is not necessary if all bell circuits are to be operated. Select circuit(s) by pressing each key corresponding to the circuit number (1) through (6). The circuit LED'S are illuminated upon their selection. Press (0) to extinguish all circuit LED'S for re-selection. A (7) selection will illuminate the system LED and extinguish all circuit LED'S. Use this selection to advance secondary clocks. The (7) key is not operative if the security switch is ON.
- Step 5. Press (#)      Pressing the (#) key will cause activation of the selected circuits. Operation of the circuits will be indicated by the blinking of the corresponding circuit indicators. If circuit reselection is desired, revert to step 4.
- Step 6. Press (\*)      To exit mode and return to normal clock operation.

EX: To signal circuits 1 and 4 for two seconds; \* # 3 # 1 4 # (Hold two seconds) \*

MODE 4      PROGRAM CIRCUITS      Security Switch must be OFF to access.

The schedule can be edited and reviewed in this routine. Time entries need not be entered in chronological order, however the bell schedule can be reviewed in chronological order backward or forward in this mode 4. The key sequence is as follows:

- Step 1. Press (#)      Request menu screen.
- Step 2. Press (4)      Select PROGRAM CIRCUITS Mode 4.
- Step 3. Press (#)      Enter mode selected in step 2. If data has previously been entered, the first event scheduled will display on screen illuminating the time, AM or PM, day(s) of week and the circuit(s). If no data has been entered, the time will have a cursor in the left digit and three zeros following.
- Step 4. OPTIONS      Three options are available: (a) Data Entry, (b) Schedule Scanning, or (c) Editing Existing Schedule as follows:
- (a) Data Entry
- Step 1. Press (6)      Only when the clock displays a cursor followed by three zeros can new data be entered. If previous data had been entered and a scheduled event is displayed on the screen, actuation of the (6) key will display a new entry position (cursor followed by three zeros).
- Step 2. Enter Time      Enter all four digits of the time (hour and minute) entering leading zeros. If the time is less than 10:00, enter (0) at the first digit [Example: at 9:30 enter (0) (9) (3) (0)]. Enter each digit noting the cursor's position marking the next digit to be entered until all four digits have been entered. At this time the AM/PM indicators will illuminate.
- Step 3. Select AM or PM      Press (0) to select PM or press (1) to select AM. The other numeric keys are not active. No selection will enter both AM and PM and result in the occurrence of a bell signal at that time both AM and PM (twice a day).
- IMPORTANT      NOTE: Check to be sure that the desired time is displayed before continuing, if not, press any numeric key and continue at step 2 above.
- Step 4. Press (#)      Enter the time data by depressing (#). A terminator (#) key will illuminate all seven day indicators.
- Step 5. Select Day(s)      Any key from (1) to (7) will select its respective day for bell actuation. If (8), (9) or (0) is pressed, all lights will be recalled. If a selection is not made, the next (#) key actuation will select the event to occur on all days.

(a) Data Entry - Continued

- Step 6. Press (#) Enter the selection by pressing (#) key. Operation will move to circuit select with all six circuit indicators being illuminated.
- Step 7. Select Circuit(s) Any numeric key between (1) and (6) will select its respective circuit and extinguish the other circuit lights. Pressing (0) will extinguish all circuit lights. After the correct circuit(s) are entered, proceed to the following step 8. If a selection is not made, actuation of the (#) key will select all circuits.
- Step 8. Press (#) Enter the data by depressing the (#) key. All data entered in steps a-2 through a-7 above will be stored. At this time the next display will be a cursor followed by three zeros for new entry. The process may be repeated from step a-2 if more data entries are desired. If this was the 128<sup>th</sup> entry, then no more data can be entered and the actuation of the (#) key will result in the display of that last entry.
- Step 9. Press (#) Exit from Data Entry can be accomplished by pressing the (#) key, while the "0:00" is displayed. Actuation of the (#) causes a display of the last edited or reviewed event for additional editing or reviewing of the schedule.
- Press (\*) to exit Mode 4 Exit from PROGRAM CIRCUITS Mode can be accomplished by pressing the abort key (\*).

EXAMPLE: To program a bell for 4:25PM, on Mon/Wed/Fri for circuits 1 and 2;

\* # 4 # 6 0 4 2 5 0 # 2 4 6 # 1 2 # \*

(b) Scanning Existing Schedule

- KEY (3) Scan Backward Actuation of the (3) key will result in the display of the previous event on the schedule. Repeatedly pressing key (3) will continue to scan, in backward chronological order, the program schedule until the first event of the day is displayed.
- KEY (#) Scan Forward Actuation of the (#) key will result in the display of the next chronological event on the schedule. Repeatedly pressing key (#) will continue to scan forward, in chronological order, until the last event of the day is displayed. Note that all entries that were input as both AM and PM will be shown at the end of the schedule after the PM entries.
- KEY (9) Find First Event Pressing the key (9) will locate and display the earliest programmed event.

EXAMPLE: Scan forward \* # 4 # # # . . . # Scan backward 3 . . . 3 \*

(c) Editing Existing Schedule.

**KEY (1) Erase Event** If key (1) is pressed with the display showing data, the data will be cleared and a new entry can be inserted. The data will clear and display a cursor followed by three zeros upon actuation of this (1) key. If key (1) is pressed while a cursor and three zeros are displayed, data will commence and operation will revert to step 4-a-2.

EX. \* # 4 # # ... scan to event 1 \*

**KEY (4) Erase Schedule** Pressing key (4) will cause the time display to show four bars. This is a warning. Actuation of the (#) key will cause all previously entered data in the schedule to be cleared and the screen will display a cursor followed by three zeros for new data entry. To avoid clearing of entire schedule simply press any key other than (#) key. Actuation of the (\*) will display normal time without clearing schedule. Actuation of any numeric key will return to the display previous to the actuation of the (4) key without clearing the schedule.

EX. \* # 4 # 4 # \*

**KEY (6) New Entry** Pressing the (6) key will cause display of a cursor followed by three zeros for new data to be entered as described in DATA ENTRY step 4-a (unless a total of 128 entries have been made).

EX. \* # 4 # 6 ... follow data entry section a.

**MODE 5 SET DURATION** Security Switch must be OFF to access.

This mode is designed to enter the number of seconds each circuit will activate at times programmed in mode 4. At power up all circuit durations are automatically set for 5 seconds.

- Step (1). Press (#) Request menu screen.
- Step (2). Press (5) Select SET DURATION Mode 5.
- Step (3). Press (#) Enter selected mode in step 2. The screen will clear and display '1' in the first position of time display identifying circuit 1, followed by a dash '-' in the second position, followed by two digits indicating the duration of signals for that particular circuit (in seconds).
- Step (4). Select Circuit Locate the circuit, whose duration is to be changed, by repeatedly pressing the (#) key until that circuit is displayed. The current duration setting will also appear on the screen.
- Step (5). Set Duration To change the duration press (01) through (99) for the desired duration (in seconds) for that circuit entering leading zeros.
- Step (6). Continue Press the (#) key to advance to the next circuit number for changing or verification.
- Step (7). Press (\*) To exit SET DURATION mode press (\*).

EXAMPLE: Set circuit 3 duration for 10 seconds; \* # 5 # # # 10 \*

**MODE 6    ENABLE CIRCUITS    Security Switch must be OFF to access.**

Circuits can be enabled or disabled in mode 6. Circuits can be disabled not to signalled during holidays, or while output devices are being serviced, etc. During the initialization, at power-up, all circuits are enabled.

The key sequence is as follows:

- Step 1. Press (#) (6) (#)    Select ENABLE CIRCUITS mode 6. The circuit indicator lights, located under the blanked time, will illuminate.
- Step 2. Select (0) - (6)    Select the desired circuits to be enabled. Press (0) to extinguish all circuit lights for disabling all circuits or for reselection purposes. When the circuits, desired to be enabled, are illuminated continue to step 3.
- Step 3. Press (#)    Enter the selection by pressing the (#) key. The normal time will be displayed illuminating those circuits enabled.

EXAMPLE: To enable circuits 1 & 2 and disable all others:

**MODE 7    DAYLIGHT SAVING    Security Switch must be OFF to access.**

All secondaries can be set forward or back one hour on the following Sunday at 2:00AM using mode 7. The digital display will simultaneously reset.

The key sequence is as follows:

- Step 1. Press (#) (7) (#)    Select DAYLIGHT SAVING mode 7. This will cause a "0" and a "1" to display. NOTE: If a daylight saving change had previously been entered, either "1" or "0" would display, indicating the previous selection.
- Step 2. Select (1) or (0)    Press (1) to to set the secondaries forward or press (0) to set the secondaries back on the following Sunday morning. Any other numeric selection will illuminate both "1" and "0" for reselection. If both "1" and "0" are displayed previous to step 3, the daylight saving change will be aborted and no clock corrections will take place.
- Step 3. Press (#)    Press (#) to enter the above selection and cause the display of normal time with the illumination of the Mode 7 LED (this LED will extinguish after the change occurs at 2:00AM Sunday morning).

EXAMPLE: To advance clocks forward on the following Sunday:

APPENDIX A  
For Use With F-9 Version EPROMS

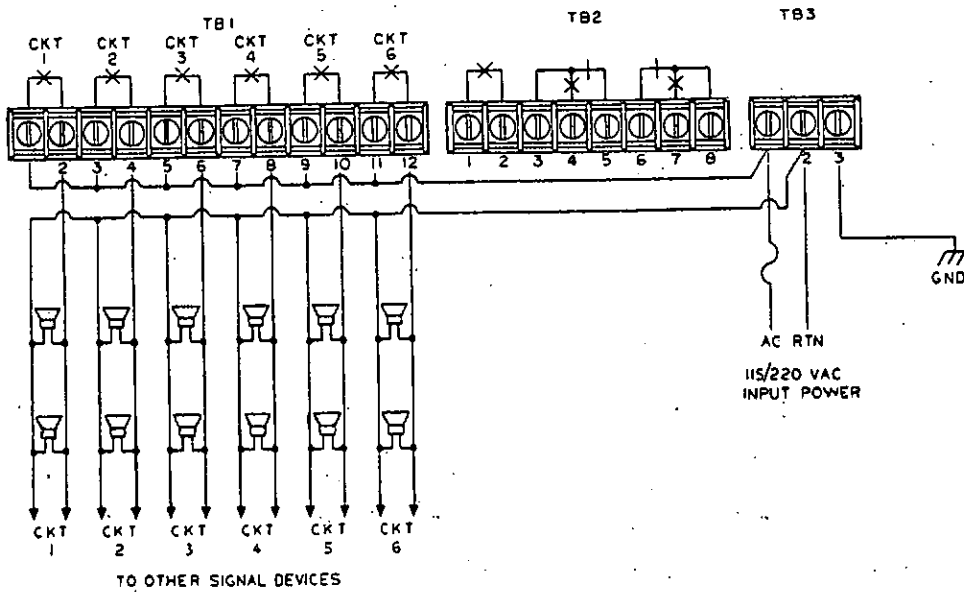
The following pages contain wiring diagrams necessary for the proper installation of secondary wall clocks and signal devices. CAUTION: Installation may present a shock hazard. Be certain to disconnect the A.C. power line before proceeding and to avoid contacting foreign objects with circuit boards.

After all wiring has been completed, follow the power-up and program procedure described on pages 4 through 10. At initial power-up the panel will display "  0" for models having F Version EPROMS. Models having other than F Version Eproms will display a "1   0" or "2   0" at initial power-up, indicating that secondary selection codes should be selected from appendix B or C. If "1   0" is displayed at initial power-up, select from the selection codes shown in appendix B. If "2   0" is displayed at initial power-up, select from the selection codes shown in appendix C.

The "  0" is a prompt for the operator to input a two digit system selection code as referenced in the set-up procedure. Follow the cursor when inputting the code. After both digits have been entered press the (#) key to store the code and advance to normal operation. Advancement to normal operation will occur only if an allowable system selection code is entered. The allowable System Selection Codes for F version EPROMS are as follows.:

SELECTION CODE	TYPE SECONDARY	REFERENCE PAGE
01	3-Wire Synchronous (59 <sup>th</sup> Min.)	a-2
02	3-Wire Minute Impulse (59 <sup>th</sup> Min.)	a-3
02	2-Wire Minute Impulse (59 <sup>th</sup> Min.)	a-4
03	Standard Electric Synchronous	a-5
04	Standard Time AR-2A Two Wire Dual Voltage	a-6
17	Standard Time AR-2 Two Wire Dual Voltage	a-7
05	3-Wire Minute Impulse (58 <sup>th</sup> Min.)	a-8
06	Synchronous Wired	a-9
07	Dukane 24F200 Digital Clocks	a-10
08	Rauland 2410 Digital Clocks (115VAC)	a-11
08	Rauland 2410 Digital Clocks (24VAC)	a-12
09	Simplex 59 <sup>th</sup> Minute Dual Motor	a-13
10	Simplex 45 <sup>th</sup> Minute Dual Motor	a-14
11	Edwards Dual Motor	a-15
17	Standard Electric Time (Model AR-3)	a-16

## TYPICAL WIRING OF SIGNAL DEVICES



Fusing source power with (or each wire loop individually) is recommended to prevent damage which may otherwise result from miswiring or excessive current consumption. Power for bells and clocks should be fused so that no more than 10 AMPS can flow through any one contact.

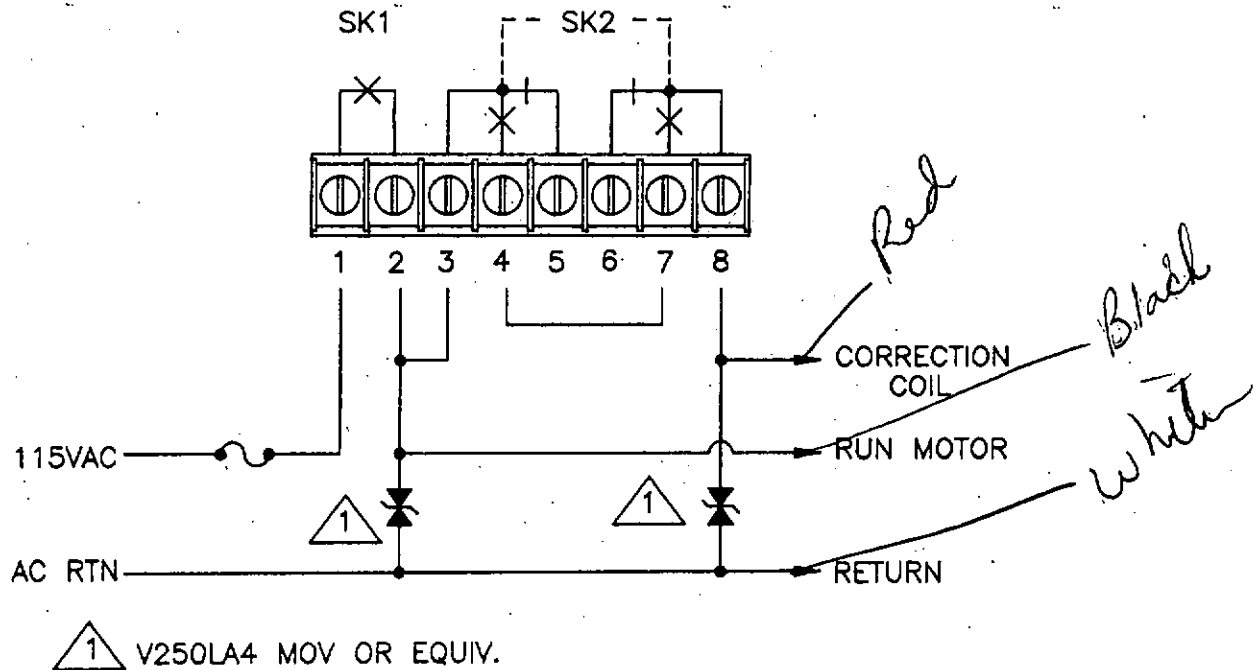
# SYNCHRONOUS WIRED

120VAC/24VAC is used to operate the clocks normally. Applying an eight second command signal on the corrective line from 57 minutes, 54 seconds to 58 minutes, 02 seconds will cause an hourly correction. Application of a command on the corrective line from 5:58:02 through 5:58:08 in addition to the hourly corrective will result in a twelve hour correction.

Types of secondary clocks covered under this type are as follows:

Cincinnati	D10
IBM	77 Series
Simplex	77 Series, 93-9, 91-9, 941-9, 943-9
Stromberg	3000
Lathem	Type SS Wall Clocks

ENTER SECONDARY SELECTION CODE 01



### THREE WIRE MINUTE IMPULSE (59TH MIN.)

From the 58<sup>th</sup> second to 00 seconds each minute a 24vdc pulse is transmitted to the secondary clocks. From the 59<sup>th</sup> minute through the 49<sup>th</sup> minute the pulse is transmitted on both the A and B lines. From the 50<sup>th</sup> minute to the 59<sup>th</sup> minute the pulse is transmitted on the A line only. Clocks which are fast and reach the 59<sup>th</sup> minute ahead of the master will stop since, at this time, they will respond only to pulses transmitted on the B line. During the 59<sup>th</sup> minute from 10 seconds through the 50<sup>th</sup> second a total of 20 rapid pulses are transmitted at a 0.5 Hz rate on the A line to advance all slow clocks.

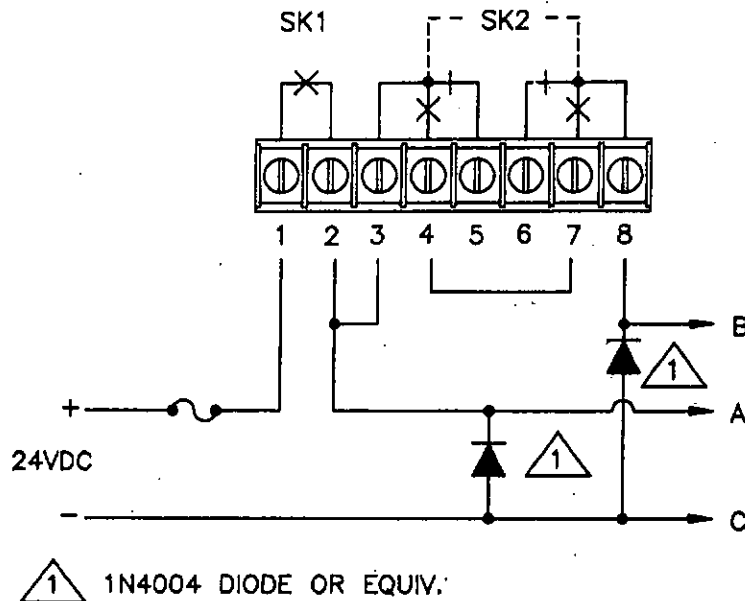
An accumulator, designed in the software, counts the number of minutes lost due to power failure. Upon resumption of power, the master transmits pulses on both lines A and B to immediately advance the slow clocks to proper time. Resetting time following a power failure will terminate these correction signals.

Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate). The first five of these pulses are transmitted on both lines A and B. The remainder of the pulses are transmitted on Line A only. Normal minute pulses are inhibited during these pulses.

Types of secondary clocks covered under this type are as follows:

Lathem	Type ISC (3-Wire)
Cincinnati	D2; D4
Edwards Impulse	
Faraday Impulse	
IBM	75 Series
Simplex	75 Series, 91-4, 93-4, 941-4, 943-4
Standard Impulse	
Stromberg Impulse	

ENTER SECONDARY SELECTION CODE 02



## TWO WIRE REVERSE POLARITY MINUTE IMPULSE (59TH MIN)

From the 58<sup>th</sup> second to 00 seconds each minute a 24vdc pulse is transmitted to the secondary clocks. From the 59<sup>th</sup> minute through the 49<sup>th</sup> minute the pulse is transmitted with line AB positive with respect to PC. From the 50<sup>th</sup> minute to the 59<sup>th</sup> minute the pulse is transmitted with line AB negative with respect to PC. Clocks which are fast and reach the 59<sup>th</sup> minute ahead of the master will stop since, at this time, they will respond only to pulses transmitted with line AB positive with respect to PC. During the 59<sup>th</sup> minute from 10 seconds through the 50<sup>th</sup> second a total of 20 rapid pulses are transmitted at a 0.5 Hz rate to advance all slow clocks. During the rapid pulsing line AB is negative with respect to PC. Use a diode connected as shown below for arc suppression of the relay contacts.

An accumulator, designed in the software, counts the number of minutes lost due to power failure. Upon resumption of power, the master transmits pulses with line AB positive with respect to PC to immediately advance the slow clocks to proper time. Resetting time following a power failure will terminate these correction signals.

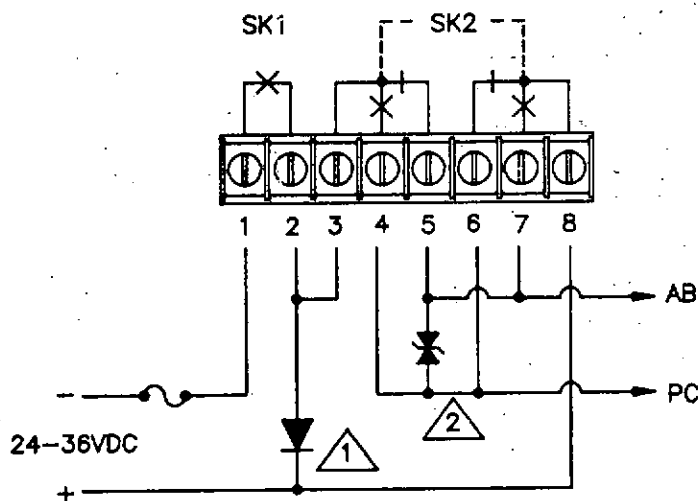
Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate). The first five of these pulses are transmitted with line AB positive with respect to line PC. The remainder of the pulses are transmitted with line AB negative with respect to line PC. Normal minute pulses are inhibited during these pulses.

Types of secondary clocks covered under this type are as follows:

Lathem  
Cincinnati Model

Type ISC (2-Wire)  
D3

ENTER SECONDARY SELECTION CODE 02



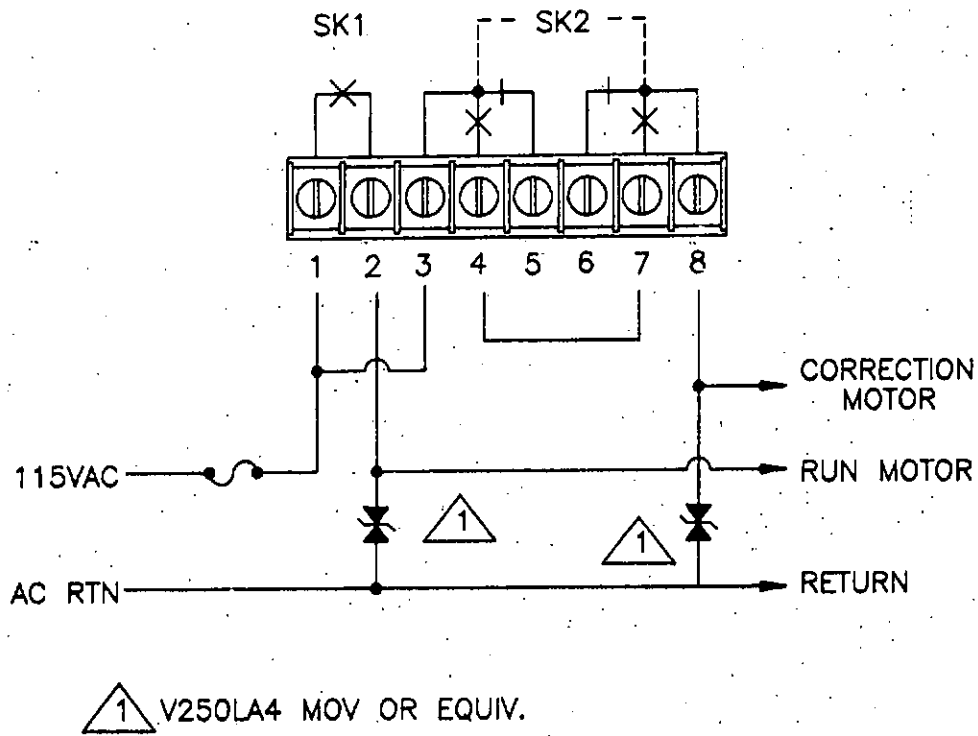
1 1N4004 DIODE OR EQUIV.

2 V250LA4 MOV OR EQUIV.

# STANDARD ELECTRIC SYNCHRONOUS

120 VAC/24VAC applied to the run motor will cause normal operation. A 15 minute correction signal on the correction motor line will cause a 12 hour correction from 5:12:00 to 5:28:00. This will occur twice daily (AM and PM). Run motor power is connected during the 12 hour correction. A 29 Second signal is applied to the correction motor line from XX:59:30 to XX:59:59 to cause hourly corrections. During hourly corrections, power is disconnected from the run motor line.

ENTER SECONDARY SELECTION CODE 03

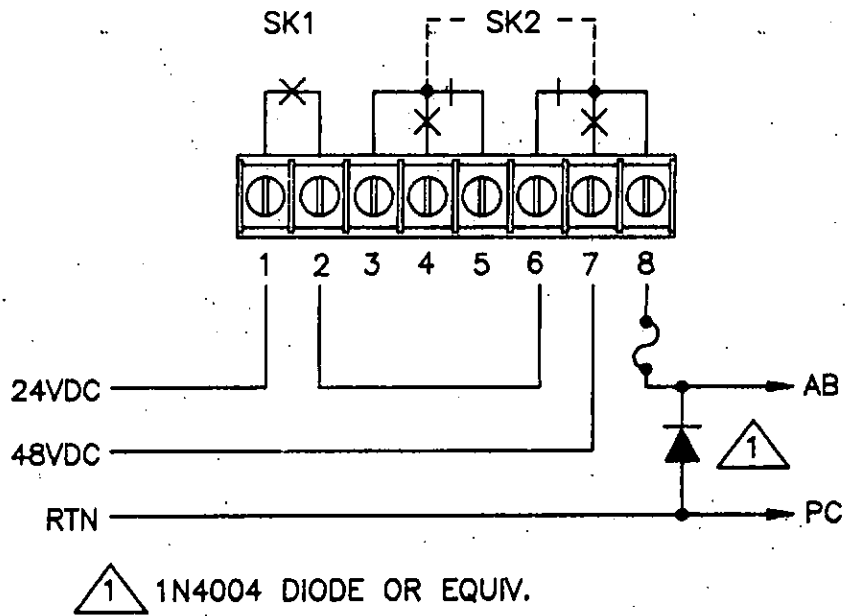


# STANDARD ELECTRIC TIME AR-2A TWO WIRE DUAL VOLTAGE

Each minute from 58" to 00" a pulse of low voltage (24VDC) will be transmitted . The secondary clocks will receive the pulses until the 59<sup>th</sup> minute. At this time from 50" to 00" a higher voltage pulse (48VDC) will be required to advance to the hour.

Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate) which are all 24Vdc. Normal minute pulses are inhibited during these pulses.

ENTER SECONDARY SELECTION CODE 04

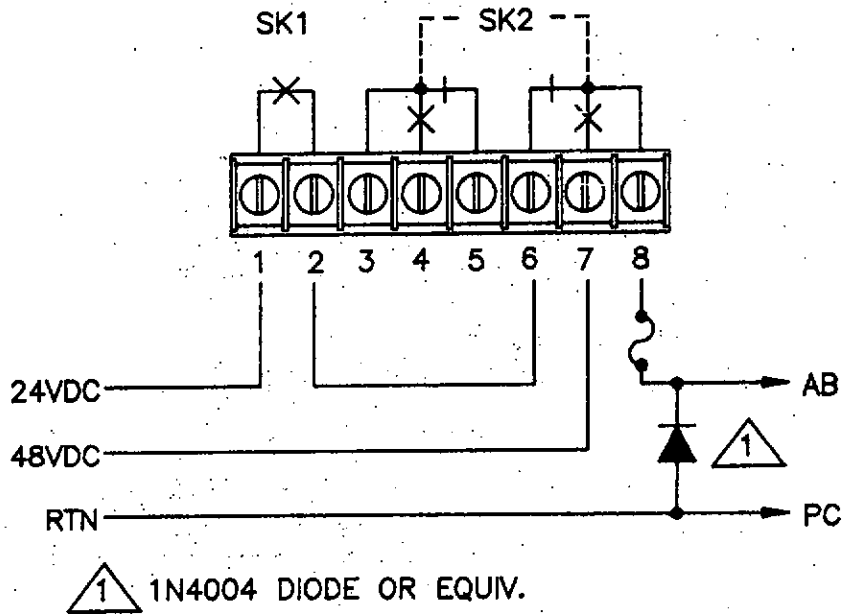


# STANDARD ELECTRIC TIME AR-2 TWO WIRE DUAL VOLTAGE

Each minute from 58" to 00" a pulse of low voltage (24VDC) will be transmitted. The secondary clocks will receive the pulses until the 58<sup>th</sup> minute. At this time from 50" to 00" a higher voltage pulse (48VDC) will be required to advance to the hour.

Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate) which are all 24Vdc. Normal minute pulses are inhibited during these pulses.

ENTER SECONDARY SELECTION CODE 17



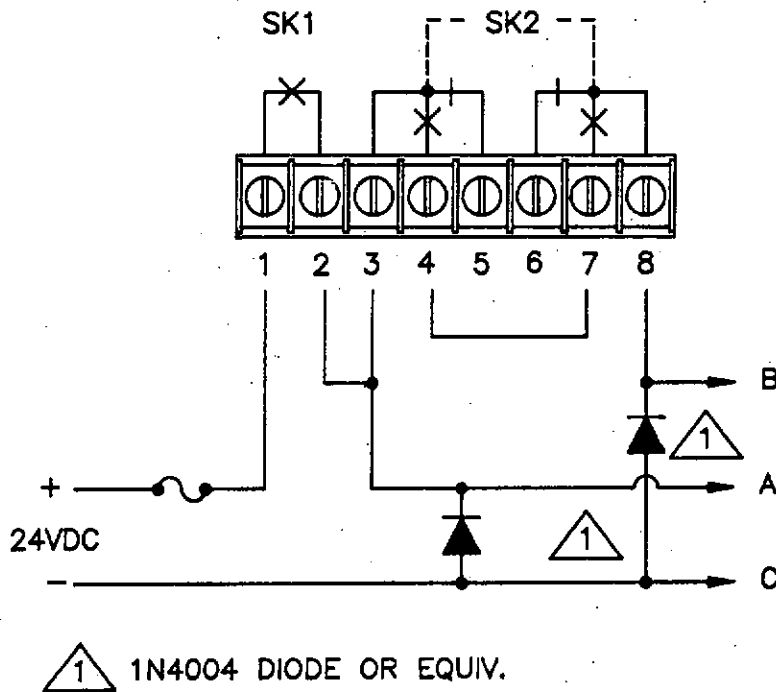
### THREE WIRE MINUTE IMPULSE (58TH MIN.)

From the 58<sup>th</sup> second to 00 seconds each minute a 24vdc pulse is transmitted to the secondary clocks. From the 58<sup>th</sup> minute through the 48<sup>th</sup> minute the pulse is transmitted on both the A and B lines. From the 49<sup>th</sup> minute to the 58<sup>th</sup> minute the pulse is transmitted on the A line only. Clocks which are fast and reach the 58<sup>th</sup> minute ahead of the master will stop since, at this time, they will respond only to pulses transmitted on the B line. During the 58<sup>th</sup> minute from 10 seconds through the 50<sup>th</sup> second a total of 20 rapid pulses are transmitted at a 0.5 Hz rate on the A line to advance all slow clocks.

An accumulator, designed in the software, counts the number of minutes lost due to power failure. Upon resumption of power, the master transmits pulses on both lines A and B to immediately advance the slow clocks to proper time. Resetting time following a power failure will terminate these correction signals.

Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate). The first five of these pulses are transmitted on both lines A and B. The remainder of the pulses are transmitted on Line A only. Normal minute pulses are inhibited during these pulses.

ENTER SECONDARY SELECTION CODE 05



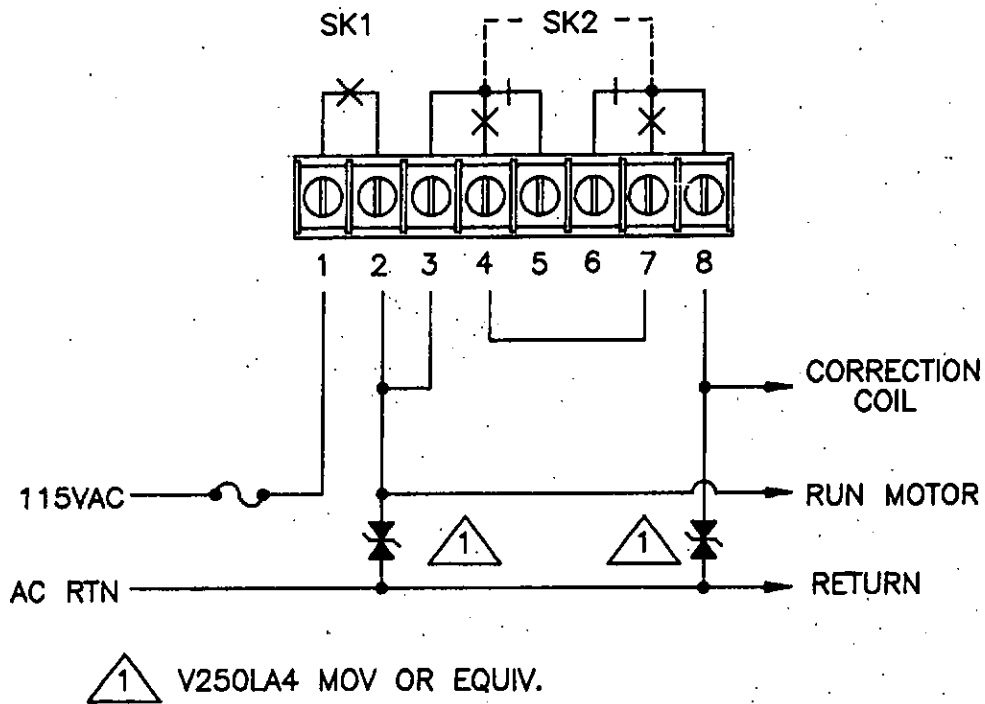
# SYNCHRONOUS WIRED

115vac is continuously furnished to the clock run motor. 115vac is furnished to the clock correction coil for 55 seconds each hour from XX:58:05 to XX:59:00 to cause hourly corrections. Ten 115vac signals are furnished to the clock correction coil (each for 95 seconds) beginning at 5:05:00, 5:07:00, 5:09:00, 5:11:00, 5:13:00, 5:15:00, 5:17:00, 5:19:00, 5:21:00 and 5:23:00 to cause the twelve-hour correction. The final twelve hour signal ends at 5:24:35 (well before the 5:30 lockout).

Types of secondary clocks covered under this type are as follows:

Cincinnati	D-8
Faraday	
Honeywell	ST402A

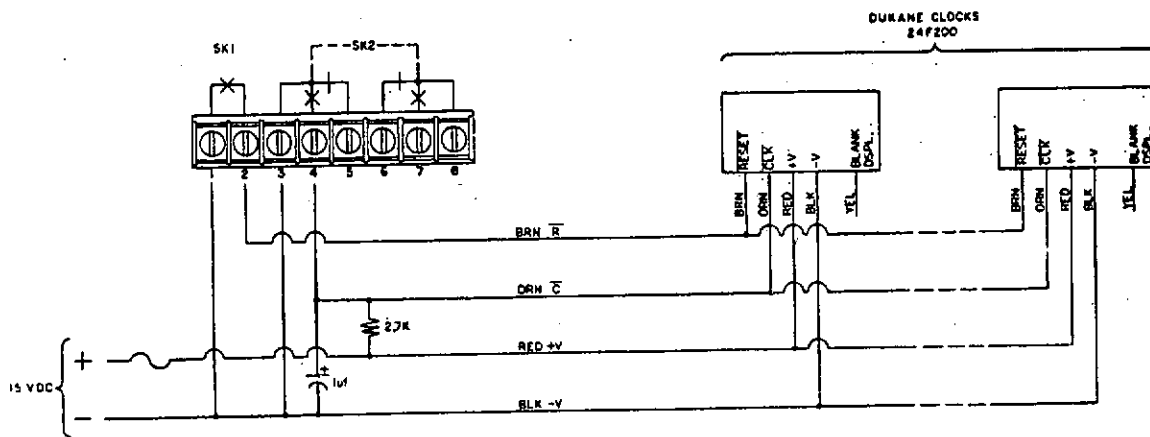
ENTER SECONDARY SELECTION CODE 06



## DUKANE 24F200 DIGITAL CLOCKS

When power is first applied to the master and system selection code 07 is entered, the master will initialize to 12:00AM and set the Dukane digital clocks will set to 0:00, an equivalent display of 12:00AM. Following this, any time change made at the master will cause the digital clocks to immediately start pulsing from the present time to the new time. If for any reason the digital clocks become unsynchronized with the master, then re-synchronization can be accomplished via mode 3 (key 7, manual clock advance). When a manual clock advance is initiated, the SYS LED will illuminate and at the 56<sup>th</sup> second the digital clocks will reset to 0:00 and then at the 59<sup>th</sup> second start pulsing to the current master time. When the digital clocks agree with the master then the SYS LED will extinguish. During normal operations the digital clocks will increment one minute each minute with the master. Each 24 hour period at 12:00:56AM the master will reset the digital clocks to 0:00 thereby synchronizing the clocks with the master. When a daylight savings mode, either forward or back, is initiated at 2:00AM Sunday, the master will reset the digital clocks to 0:00 and then impulse the clocks to the new time, either 1:00AM or 3:00AM.

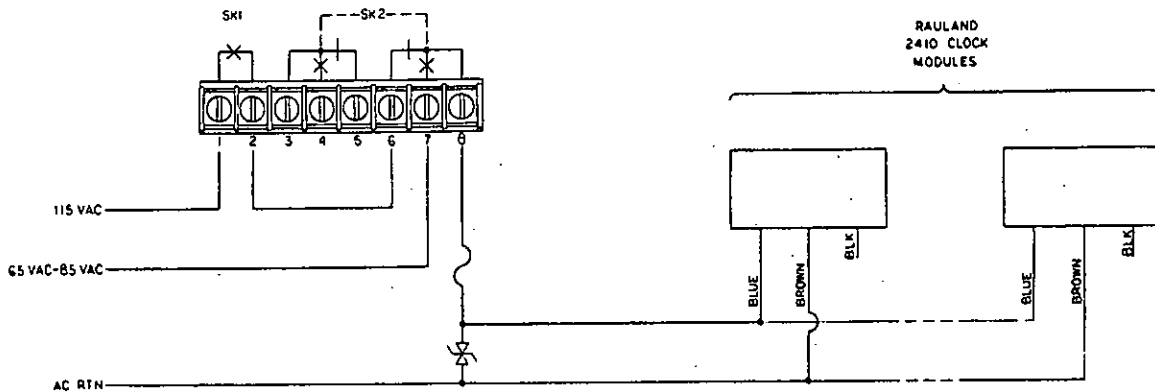
### ENTER SECONDARY SELECTION CODE 07



# RAULAND 2410 DIGITAL CLOCKS (115VAC)

The Rauland 115VAC digital clocks initialize to 12:01AM when power is first applied. During normal operation the clocks maintain time by counting the AC line frequency, 60Hz. When the line voltage is dropped below its normal 115VAC level the digital clocks will start rapidly advancing at a rate of two minutes per second. After applying power to the master and entering system selection code 08, the master will initialize to 12:01AM and apply normal voltage to the digital clocks causing them to set to 12:01AM. After power-up, any time change made at the master will cause the SYS LED to illuminate, indicating a correction of the digital clocks is about to take place. At the 56<sup>th</sup> second the master will remove power from the digital clocks and then at the 59<sup>th</sup> second will apply low voltage to the clocks causing them to rapidly advance toward the new time. When the new time is reached the master will reapply normal voltage. If for any reason the digital clocks become unsynchronized with the master, then re-synchronization can be accomplished via mode 3 (key 7, manual clock advance). When a manual clock advance is initiated, the SYS LED will illuminate and at the 56<sup>th</sup> second power will be removed and a low voltage applied at the 59<sup>th</sup> second causing the clocks to advance to the current master time at which point normal voltage is reapplied. When a daylight savings mode, either forward or back, is initiated at 2:00AM Sunday, the master will remove power from the clocks and then apply low voltage causing the clocks to rapidly advance to the new time, either 1:00AM or 3:00AM, at which point normal voltage is reapplied. Each 24 hour period at 12:00:56AM the master removes power from the clocks and then at 12:00:59AM reapplies power causing the clocks to set to 12:01:00AM, thereby synchronizing the clocks with the master.

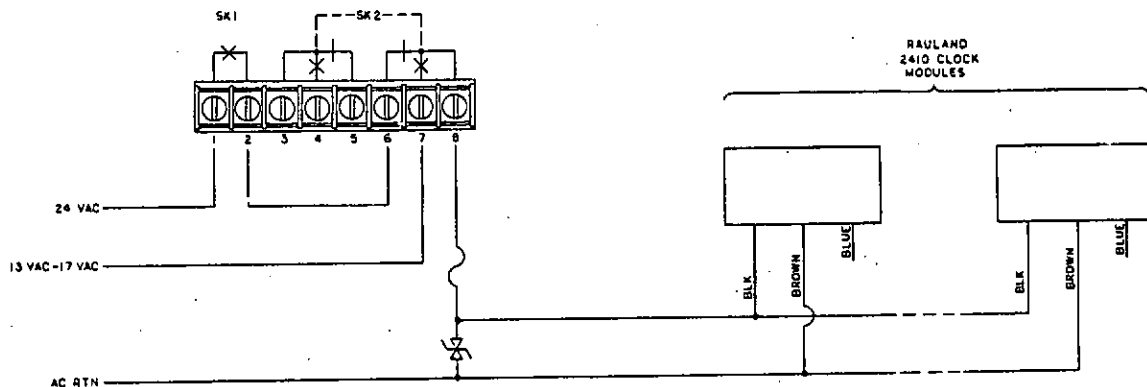
## ENTER SECONDARY SELECTION CODE 08



## RAULAND 2410 DIGITAL CLOCKS (24VAC)

The Rauland 24VAC digital clocks initialize to 12:01AM when power is first applied. During normal operation the clocks maintain time by counting the AC line frequency, 60Hz. When the line voltage is dropped below its normal 24VAC level the digital clocks will start rapidly advancing at a rate of two minutes per second. After applying power to the master and entering system selection code 08, the master will initialize to 12:01AM and apply normal voltage to the digital clocks causing them to set to 12:01AM. After power-up, any time change made at the master will cause the SYS LED to illuminate, indicating a correction of the digital clocks is about to take place. At the 56<sup>th</sup> second the master will remove power from the digital clocks and then at the 59<sup>th</sup> second will apply low voltage to the clocks causing them to rapidly advance toward the new time. When the new time is reached the master will reapply normal voltage. If for any reason the digital clocks become unsynchronized with the master, then re-synchronization can be accomplished via mode 3 (key 7, manual clock advance). When a manual clock advance is initiated, the SYS LED will illuminate and at the 56<sup>th</sup> second power will be removed and a low voltage applied at the 59<sup>th</sup> second causing the clocks to advance to the current master time at which point normal voltage is reapplied. When a daylight savings mode, either forward or back, is initiated at 2:00AM Sunday, the master will remove power from the clocks and then apply low voltage causing the clocks to rapidly advance to the new time, either 1:00AM or 3:00AM, at which point normal voltage is reapplied. Each 24 hour period at 12:00:56AM the master removes power from the clocks and then at 12:00:59AM reapplies power causing the clocks to set to 12:01:00AM, thereby synchronizing the clocks with the master.

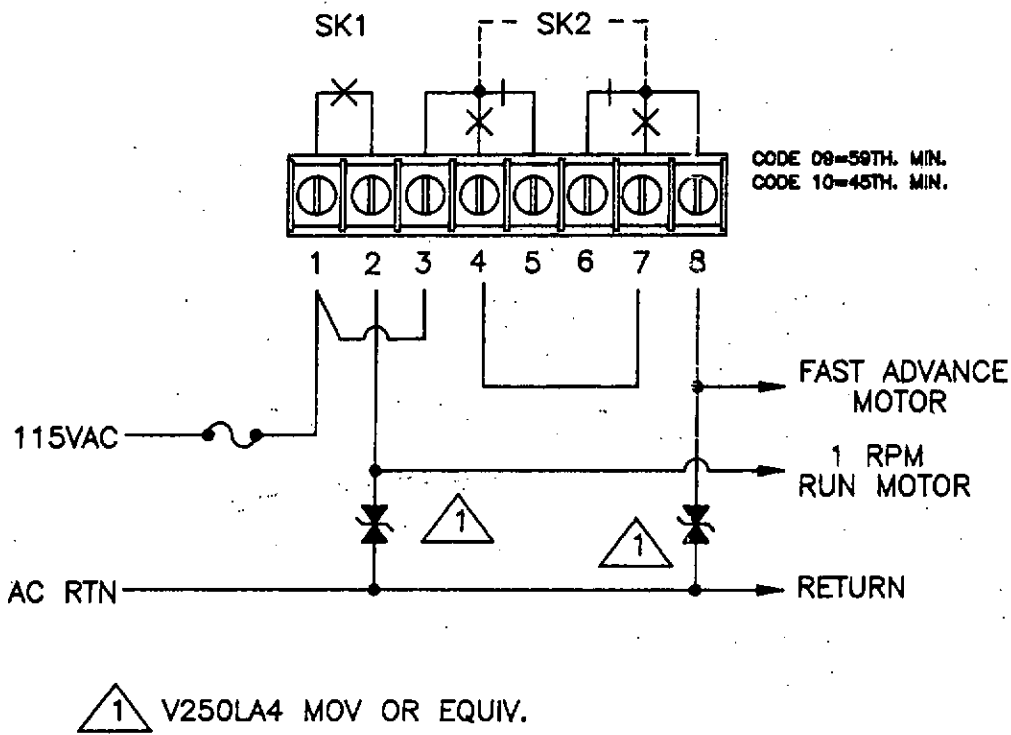
ENTER SECONDARY SELECTION CODE 08



# SIMPLEX 59TH MINUTE DUAL MOTOR

Normally power is applied to the 1RPM run motor. Each hour from HH:58:05 through HH:58:59, power is removed from the 1RPM run motor and applied to the fast advance motor for 4 minutes and 15 seconds. During manual clock corrections, power is applied to both the 1RPM run motor and the fast advance motor 4 minutes and 15 seconds.

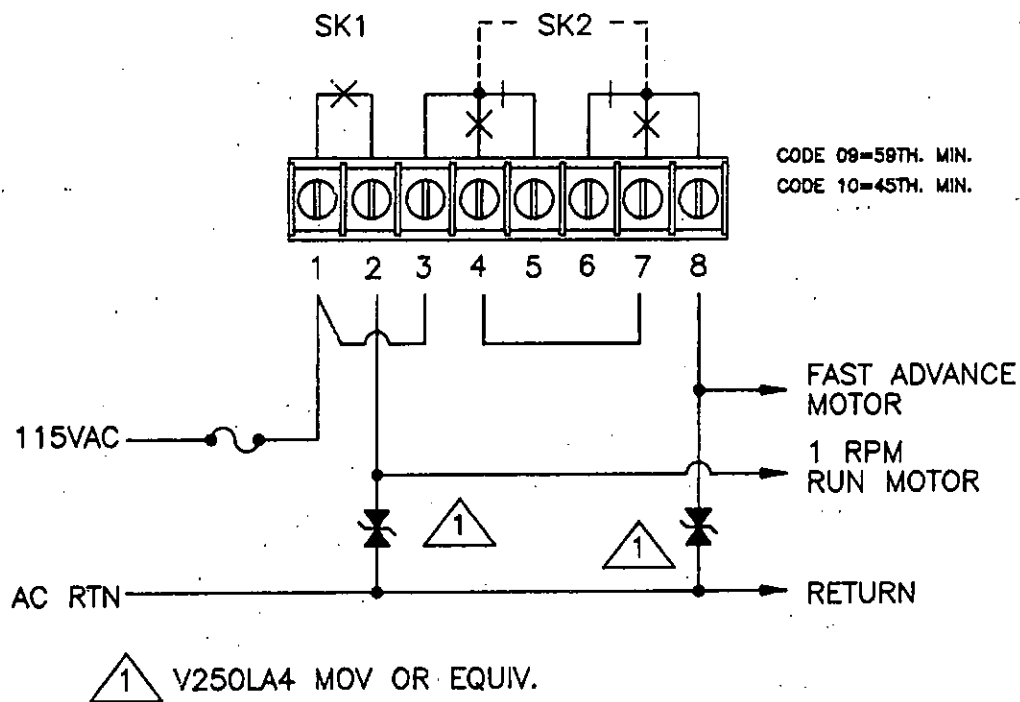
ENTER SECONDARY SELECTION CODE 09



# SIMPLEX 45TH MINUTE DUAL MOTOR

Normally power is applied to the 1RPM run motor. Each hour from HH:44:05 through HH:44:59 power is removed from the 1RPM run motor and applied to the fast advance motor. During manual clock corrections, power is applied to both the 1RPM run motor and the fast advance motor for 4 minutes and 15 seconds.

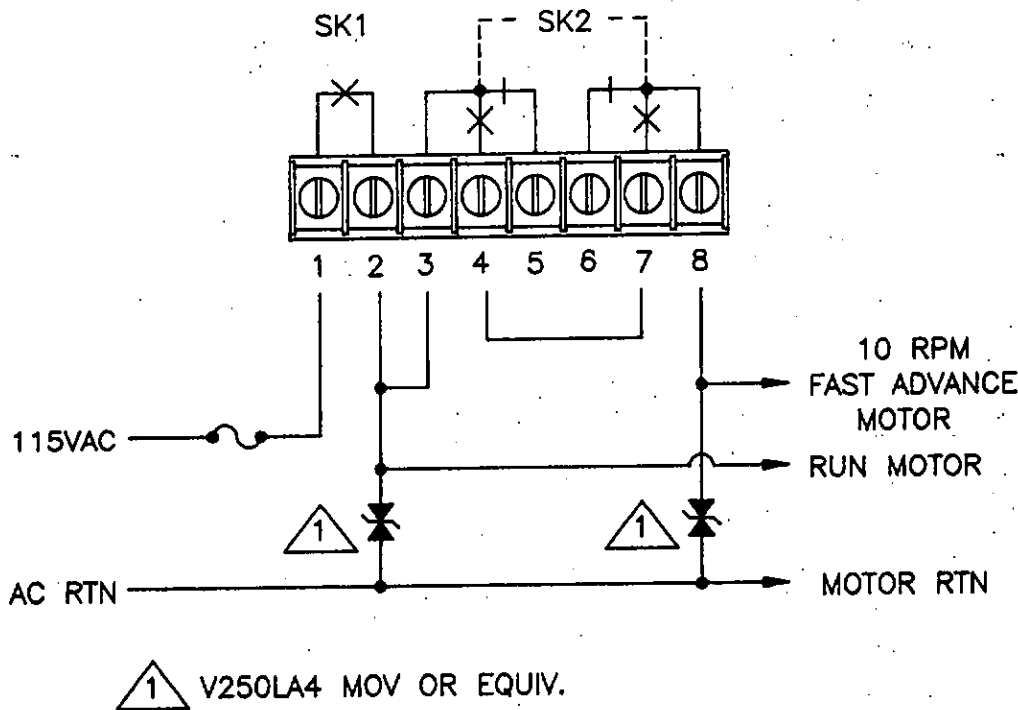
ENTER SECONDARY SELECTION CODE 10



# EDWARDS DUAL MOTOR

Normally power is applied only through relay SK1 to the run motor causing normal timekeeping. During power failures (while clocks are stopped) and during correction the master accumulates the number of seconds. Immediately following power restoration both relays SK1 and SK2 will operate. Relay SK2 is operated, applying power to the 10RPM motor, for 1/10th the number of seconds accumulated causing the clocks to advance to the correct time. After correction relay SK2 opens and relay SK1 continues to operate. For daylight savings the master either automatically de-energizes relay SK1 to cause the clocks to loose one hour or energizes SK2 for 6 minutes and approximately 40 seconds to cause the clocks to advance one hour. The clocks can also be manually advance one hour via mode 3. The manual advance and correction advances due to power failure can be aborted at any time by again entering mode 3. This method of abort is for convenience when clocks need to be advanced less than one hour. To cause clocks to loose time remove relay SK1 for the amount of time desired.

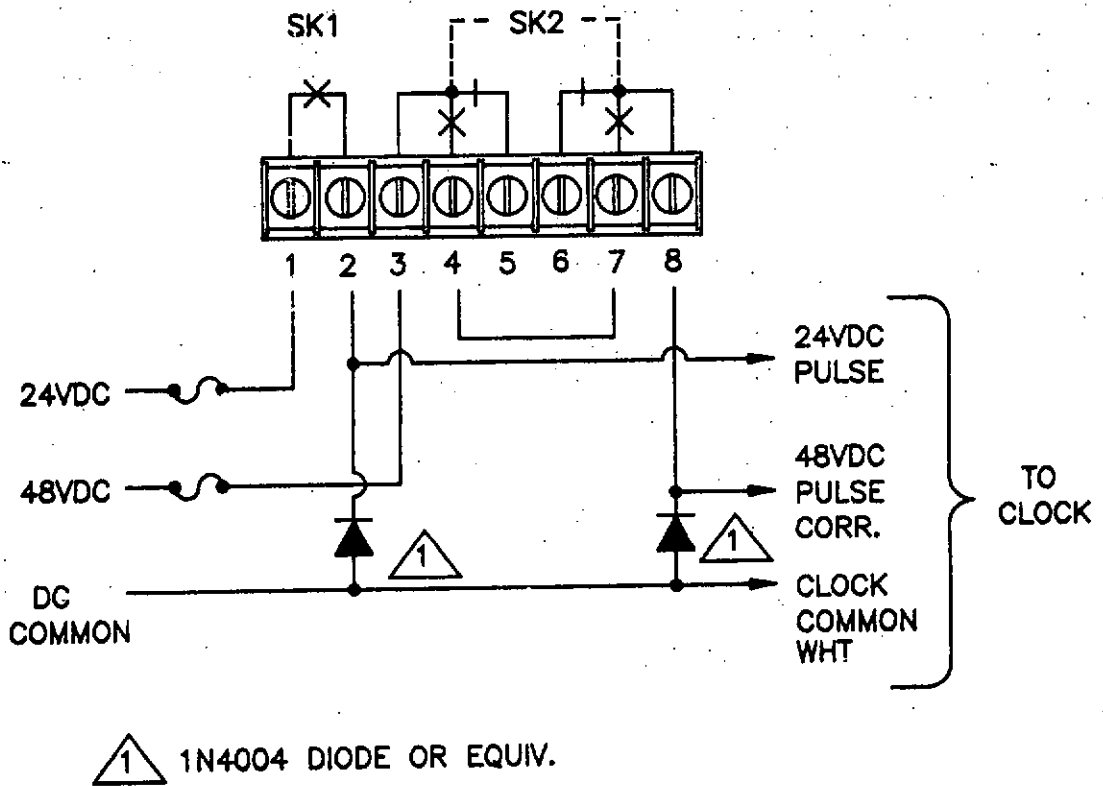
ENTER SECONDARY SELECTION CODE 11



# STANDARD ELECTRIC TIME AR-3 THREE WIRE IMPULSE

Each minute from 58" to 00" a pulse will be transmitted on line A. The secondary clocks will receive the pulses on line A until the 58<sup>th</sup> minute. At this time from 50" to 00" a pulse on line B will be required to advance to the 59<sup>th</sup> minute.

ENTER SECONDARY SELECTION CODE 17



APPENDIX B  
For Use With G-9 Version EPROMS

The following pages contain wiring diagrams necessary for the proper installation of secondary wall clocks and signal devices. CAUTION: Installation may present a shock hazard. Be certain to disconnect the A.C. power line before proceeding and to avoid contacting foreign objects with circuit boards.

After all wiring has been completed, follow the power-up and program procedure described on pages 4 through 10. At initial power-up the panel will display "0", "1 0", or "2 0". The "1 0" is displayed if the EPROMS are G version. The selection codes shown below are available for G version EPROMS. If "0" is displayed at initial power-up, select from the selection codes shown in appendix A. If "2 0" is displayed at initial power-up, select from the selection codes shown in appendix C.

The "1 0" is a prompt for the operator to input a two digit system selection code as referenced in the set-up procedure. Follow the cursor when inputting the code. After both digits have been entered press the (#) key to store the code and advance to normal operation. Advancement to normal operation will occur only if an allowable system selection code is entered.

The allowable System Selection Codes for G version EPROMS are as follows:

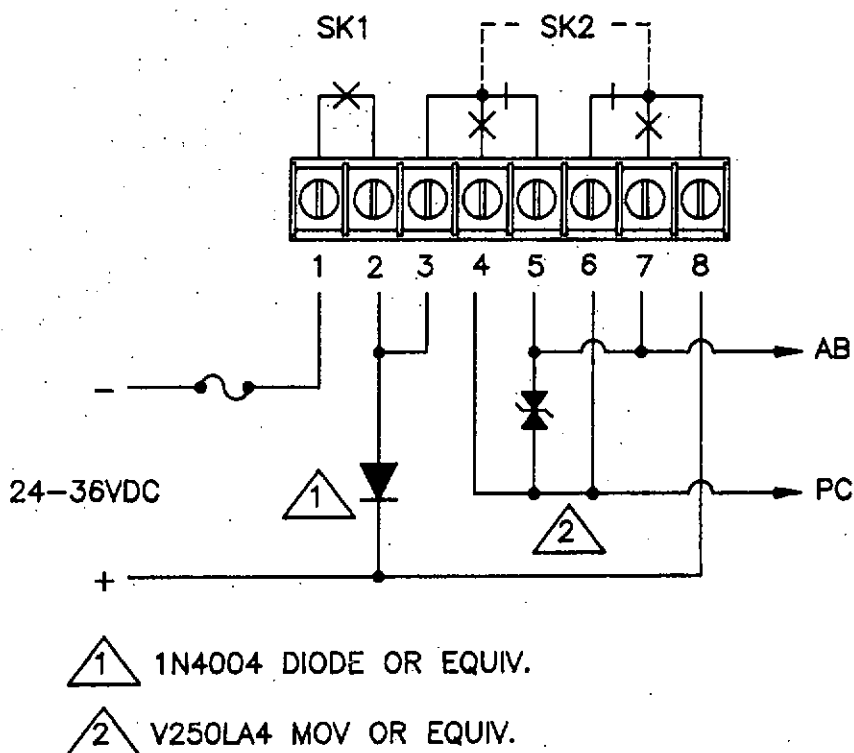
SELECTION CODE	TYPE SECONDARY	REFERENCE PAGE
12	Cincinnati D6	b-1
13	2-Wire Pulse Alternating (24VDC)	b-2
14	Electronic Coded Clocks	b-3
15	Straight Frequency	b-4
16	3-Wire Impulse (59TH Min. with 12 hour correction)	b-5
16	2-Wire Impulse (59TH Min. with 12 hour correction)	b-6

## CINCINNATI D6 CLOCKS

Normal pulsing will be sent out on lines A & C from second 58 through second 00 each minute. From minute 59 through minute 49, line A will be positive with respect to line C. From minute 50 through minute 58, except from 4:49 through 5:55 AM & PM, line C will be positive with respect to line A. To provide hourly corrections, 20 rapid pulses occurring at a 0.5Hz rate are transmitted on lines A&C, line C positive with respect to line A, during the 59<sup>th</sup> minute of each hour from second 10 through second 50. To provide twelve hour corrections, 20 rapid pulses occurring at a 0.5Hz rate are transmitted from second 10 through second 54 of each minute from 5:00:10 through 5:30:54 AM & PM.

Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate). The first five of these pulses are transmitted with line A positive with respect to line C. The remainder of the pulses are transmitted with line A negative with respect to line C. Normal minute pulses are inhibited during these pulses.

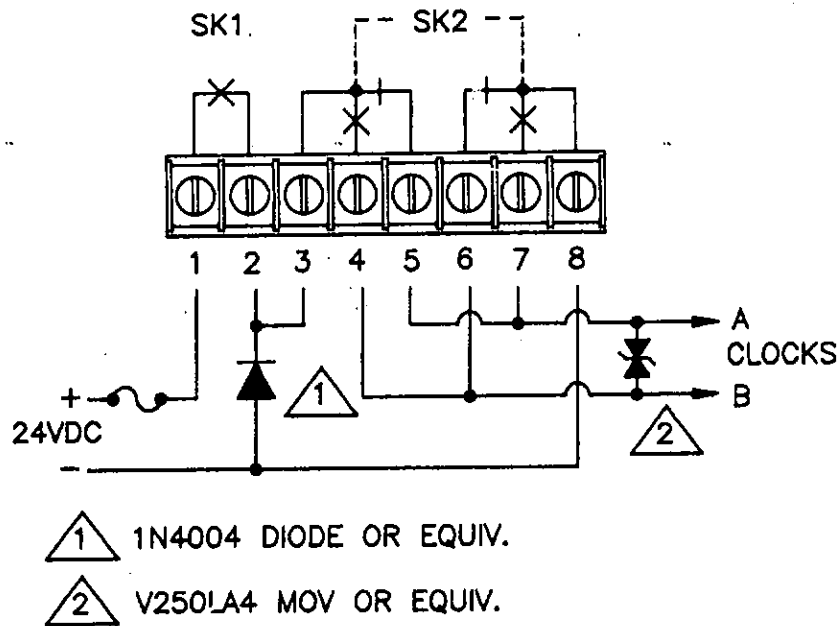
ENTER SECONDARY SELECTION CODE 12



## 2-WIRE PULSE ALTERNATING (24VDC)

Each minute from 59 seconds to 00 seconds a 24VDC signal is applied on lines A and B causing the wall clocks to advance one minute. The polarity of the pulse is alternated each minute to cause A to be positive with respect to B one minute, then B positive with respect to A the next minute, etc. During power failures pulses shall not be issued to the clocks; however, the master shall accumulate the number of minutes lost. Upon power restoration the master shall rapidly issue pulses, 30 per minute, to correct the clocks. The clocks can be manually advanced 60 minutes via the master. A total of 62 pulses are issued during manual advance (2 normal pulses plus 60 extra advance pulses).

ENTER SECONDARY SELECTION CODE 13

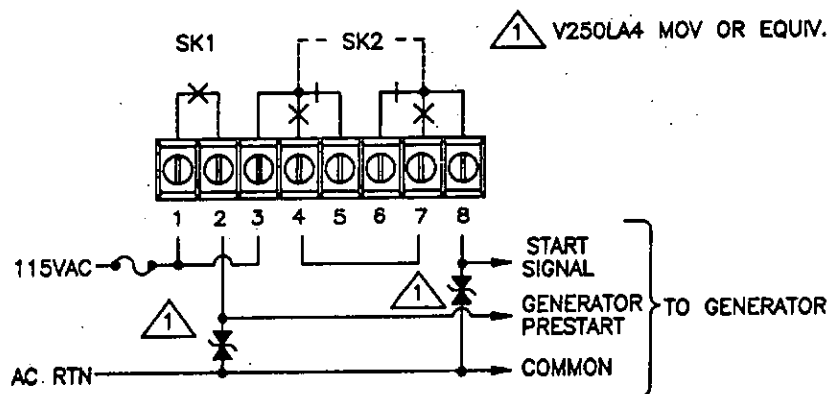


# ELECTRONIC CODED CLOCKS

Clocks operate normally with the application of 120 VAC. Whenever bell operation or clock correction is to occur, whether automatic or manual, the generator prestart relay (SK1), will first operate to allow the signal generator to reach frequency. SK1 begins operating at the 00 second following a programmed time or time of manual bell. Then relay SK2 operates three seconds from the 10<sup>th</sup> to the 13<sup>th</sup> second, to apply the generator signal (coded cup start signal) onto the 120 VAC. Bell circuits will then energize for 3 seconds in the sequence listed below applying the generator signal onto the 120 VAC for decoding by the coded cups. The bell relay contacts must be connected in parallel with the normally open contacts of relay SK2. If it is not time for a clock correction signal, then the generator prestart relay SK1 will de-energize at the 59th second. At the 57<sup>th</sup> minute of each hour relay SK2 will energize from 57:54 to 58:02, thereby applying the eight second hourly correction generator signal onto the 120 VAC. At 5:57AM and 5:57PM (12 hour correction), relay SK2 will energize from 5:57:54 to 5:58:08, thereby applying a fourteen second twelve hour correction generator signal onto the 120 VAC. The Daylight Savings feature will advance clocks correctly but has no means, other than normal 12 hour correction, to correct secondaries a 2:00AM. The time sequence of each relay operation is listed below:

RELAY		FROM	TO	FROM	TO
K1 Gen. Prestart	(hourly corr.)	H:57:00"			H:59:00
SK2 Start Signal	(hourly corr.)	H:57:10	H:57:13	H:57:54	H:58:02
SK1 Gen. Prestart	(12 hour corr.)	H:57:00			H:59:00
Sk2 Start Signal	(12 hour corr.)	5:57:10	5:57:13	5:57:54	5:58:08
Sk1 Gen. Prestart	(bells)	H:MM:00	H:MM:59		
Sk2 Start Signal	(bells)	H:MM:10	H:MM:13		
Bell Circuit 6		H:MM:20	H:MM:23		
Bell Circuit 5		H:MM:25	H:MM:28		
Bell Circuit 4		H:MM:30	H:MM:33		
Bell Circuit 3		H:MM:35	H:MM:38		
Bell Circuit 2		H:MM:40	H:MM:43		
Bell Circuit 1		H:MM:45	H:MM:48		

ENTER SECONDARY SELECTION CODE 14



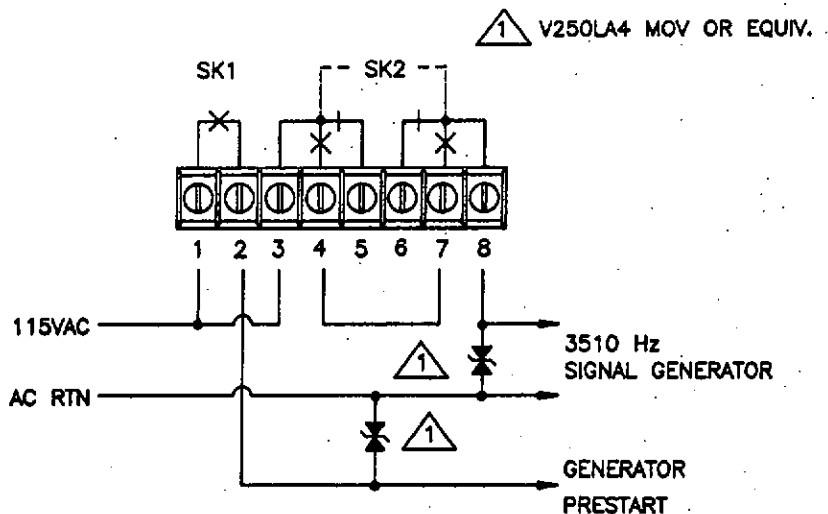
# STRAIGHT FREQUENCY

Clock correction and bell circuit operations are generated by sequentially applying various frequencies onto the 120 VAC. A unique frequency is assigned to each bell and clock correction circuit. Each bell and clock correction circuit is provided with a receiver circuit which applies the associated bell or clock frequency (3510 Hz normally used for clock signals). The Daylight Savings feature will advance clocks correctly but has no means, other than normal 12 hour correction, to correct secondaries at 2:00AM. The time sequence of applying the frequencies to the 120 VAC is shown below and is controlled by the bell and system relays in the master unit:

<u>RELAY</u>		<u>FROM</u>	<u>TO</u>
Bell Ckt. 1		H:MM:00	H:MM:05
Bell Ckt. 2		H:MM:05	H:MM:10
Bell Ckt. 3		H:MM:10	H:MM:15
Bell Ckt. 4		H:MM:15	H:MM:20
Bell Ckt. 5		H:MM:20	H:MM:25
Bell Ckt. 6		H:MM:25	H:MM:30
SK2	(Hourly Correction) (12-Hour Correction)	H:57:54 5:57:54	H:58:02 5:58:08
SK1	(Hourly Correction & 12-Hour Correction) (Bells)	H:57:00 35 sec of min previous to Bell	H:59:00 30 sec of Bell time

NOTE: Bells must be programmed 1 minute ahead of desired time. Bells will be inhibited during the 58th minute and manual clock corrections.

## ENTER SECONDARY SELECTION CODE 15



STRAIGHT FREQUENCY  
SYSTEM SELECTION CODE 15

### THREE WIRE MINUTE IMPULSE (59 MIN.) WITH 12 HOUR CORRECTION

Each hour from the 59<sup>th</sup> minute through the 49<sup>th</sup> minute a two second pulse starting at the 58<sup>th</sup> second and ending at 00 seconds will be transmitted on both the A and B lines causing all clocks to advance each minute. From the 50<sup>th</sup> minute to the 59<sup>th</sup> minute, transmission will be on the A line only. Clocks which are less than ten minutes fast will stop at the 59<sup>th</sup> minute since they transfer to the B line at this time. Each hour starting at the 59<sup>th</sup> minute and 10 seconds a total of twenty rapid pulses occurring at a rate of 0.5 Hz will be transmitted on the A line. Clocks which are slow will be advanced at this pace. Each twelve hour period from 6:02 through 6:34 twenty-three rapid pulses will be transmitted each minute on the A line, with transmission starting at 10 seconds after and ending at 55 seconds after. Clocks which are more than one hour slow will be rapidly advanced toward correct time.

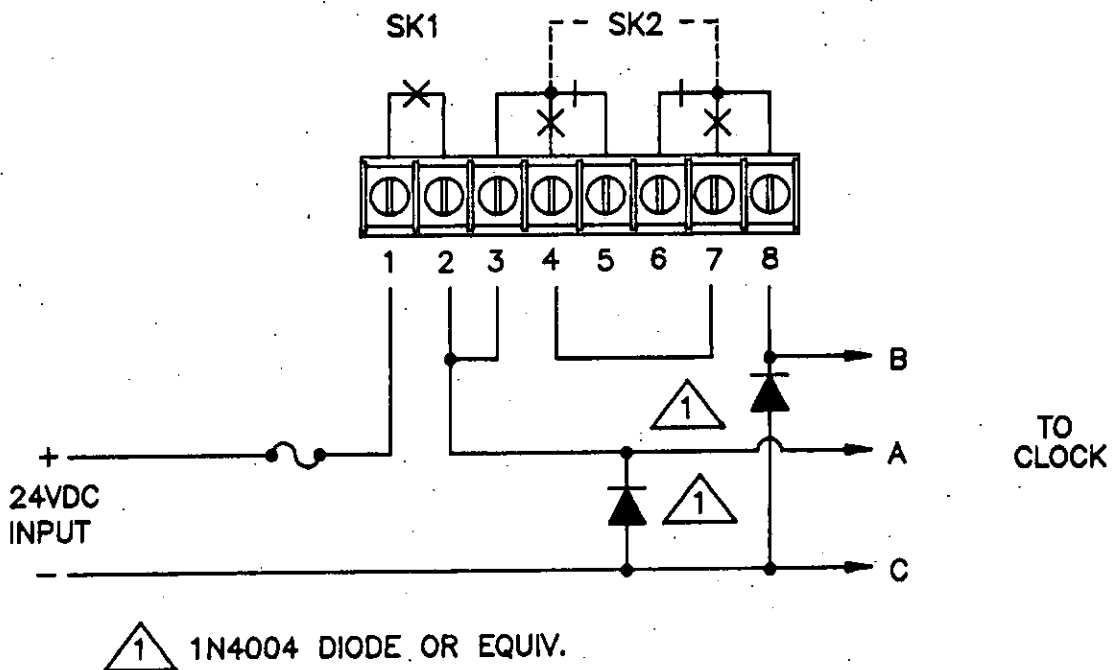
Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate). The first five of these pulses are transmitted on both lines A and B. The remainder of the pulses are transmitted on Line A only. Normal minute pulses are inhibited during these pulses.

Types of secondary clocks covered under this type are as follows:

Simplex

91 and 941

ENTER SECONDARY SELECTION CODE 16

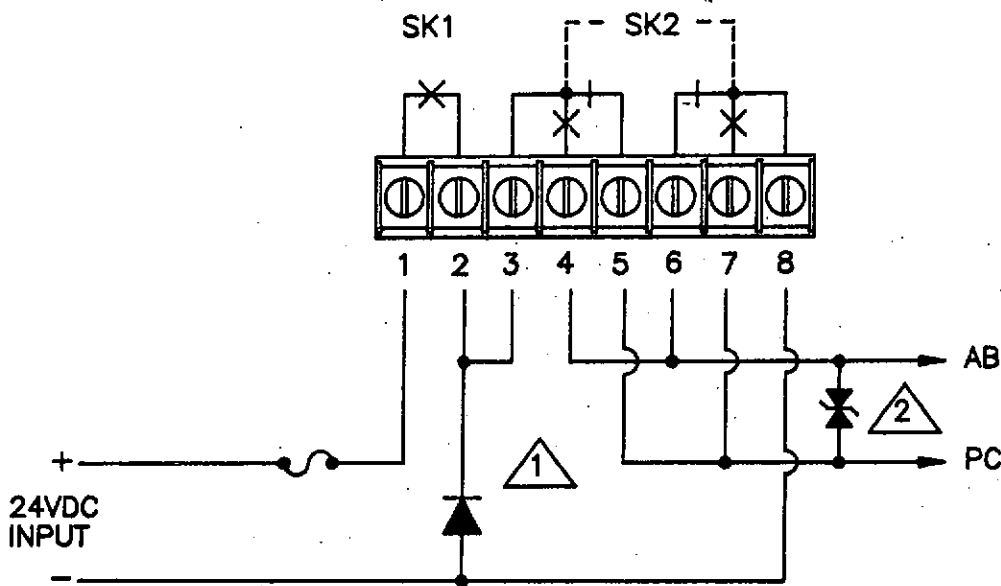


**TWO WIRE REVERSE POLARITY MINUTE IMPULSE (59 MIN.)  
WITH 12 HOUR CORRECTION**

Each hour from the 59<sup>th</sup> minute through the 49<sup>th</sup> minute a two second pulse starting at the 58<sup>th</sup> second and ending at 00 seconds will be transmitted between lines AB and PC (with AB positive with respect to PC) causing all clocks to advance each minute. From the 50<sup>th</sup> minute to the 59<sup>th</sup> minute, transmission will be such that PC is positive with respect to AB. Clocks which are less than ten minutes fast will stop at the 59<sup>th</sup> minute since their SR contacts transfer and require a pulse with AB positive with respect to PC to advance at this time. Each hour, starting at the 59<sup>th</sup> minute and 10 seconds, a total of twenty rapid pulses will be transmitted with line PC positive with respect to AB at a rate of 0.5 Hz. Clocks which are slow will be advanced at this pace. Each twelve hour period from 6:02 through 6:34 twenty-three rapid pulses will be transmitted each minute, line PC positive with respect to line AB, with transmission starting at 10 seconds after and ending at 55 seconds after. Clocks which are more than one hour slow will be rapidly advanced to correct time.

Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate). The first five of these pulses are transmitted with line AB positive with respect to line PC. The remainder of the pulses are transmitted with line AB negative with respect to line PC. Normal minute pulses are inhibited during these pulses. Normal minute pulses are inhibited during these pulses.

ENTER SECONDARY SELECTION CODE 16



1 1N4004 DIODE OR EQUIV.

2 V250LA4 MOV OR EQUIV.

**APPENDIX C**  
**For Use With H-9 Version EPROMS**

The following pages contain wiring diagrams necessary for the proper installation of secondary wall clocks and signal devices. **CAUTION:** Installation may present a shock hazard. Be certain to disconnect the A.C. power line before proceeding and to avoid contacting foreign objects with circuit boards.

After all wiring has been completed, follow the power-up and program procedure described on pages 4 through 10. At initial power-up the panel will display "0", "1 0", or "2 0". The "2 0" is displayed if the EPROMS are H version. The selection codes shown below are available for H version EPROMS. If "0" is displayed at initial power-up, select from the selection codes shown in appendix A. If "1 0" is displayed at initial power-up, select from the selection codes shown in appendix B.

The "2 0" is a prompt for the operator to input a two digit system selection code as referenced in the set-up procedure. Follow the cursor when inputing the code. After both digits have been entered press the (#) key to store the code and advance to normal operation. Advancement to normal operation will occur only if an allowable system selection code is entered.

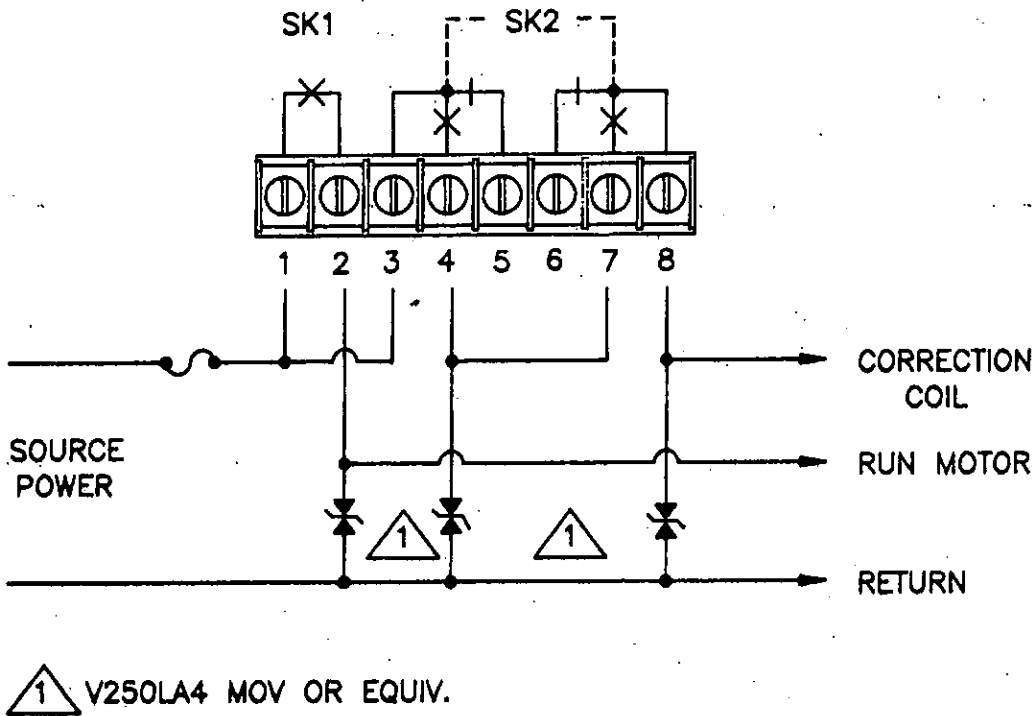
The allowable System Selection Codes for H version EPROMS are as follows:

SELECTION CODE	TYPE SECONDARY	REFERENCE PAGE
18	National Synchronous Wired	c-1
19	Stromberg Synchronous Wired (56 <sup>th</sup> Min.)	c-2
20	Three Wire Minute Impulse (44 <sup>th</sup> Min.)	c-3
21	Cincinnati D-1	c-4
22	Dukane Synchronous Wired	c-5
23	Condor Digital Clocks (Model 2412)	c-6
24	Edwards Synchronous Wired Type E-1	c-7

# NATIONAL SYNCHRONOUS WIRED

Relay SK1 is normally operated to pass source power through to the clock run motors. Each hour from HH:00:00 to HH:00:28 relay SK2 is operated which passes source power through to the clock correction coils for 28 seconds and causes hourly correction. Every 12 hours from 6:00:00 to 6:27:27 relay SK2 is again operated to pass source power through to the clock correction coils for 27 minutes causing 12 hour correction. Manual clock corrections can be issued from the master during any even minute except 00.

ENTER SECONDARY SELECTION CODE 18

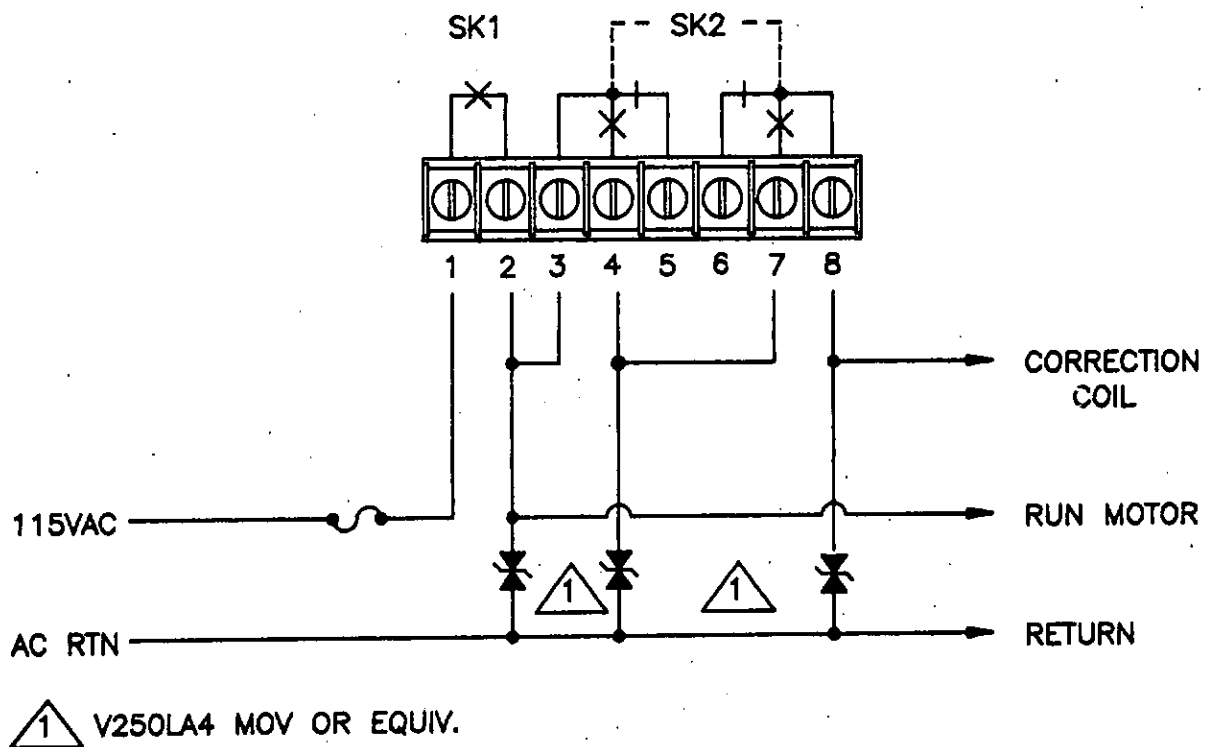


# STROMBERG SYNCHRONOUS WIRED (56<sup>th</sup> MIN.)

120VAC/24VAC is used to operate the clocks normally. Relay SK1 is normally operated to supply run motor power. Relay SK2 activates each hour from HH:56:10 to HH:56:18 causing an 8 second signal to be transmitted on the correction line for hourly correction. Relay SK2 activates each twelve hours from 11:56:36 to 11:56:50 causing an additional 14 second signal to be transmitted on the correction line for twelve hour correction. During power failures and automatic clock resetting relay SK1 is deactivated.

## ENTER SECONDARY SELECTION CODE 19

NOTE: Lathem type SS wall clocks will operate according to the above signal operation if modified to reference the minute and second hands to HH:57:16 (versus HH:59:00) and the hour hand to 12 O'clock versus 6 O'clock.

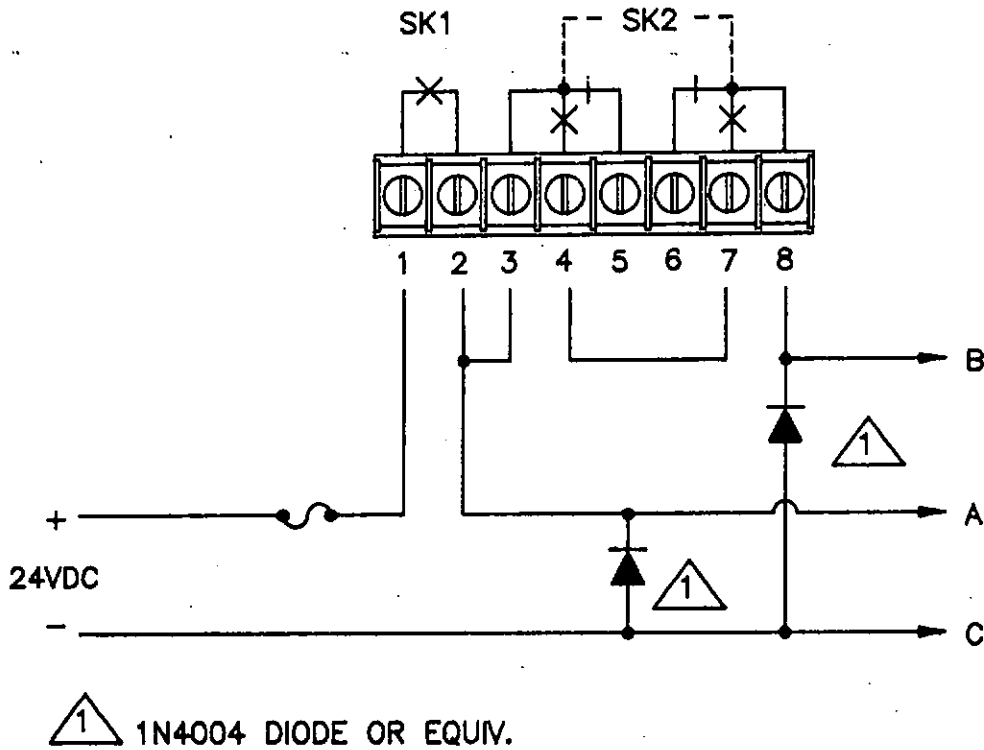


### THREE WIRE MINUTE IMPULSE (44TH MIN.)

From the 58<sup>th</sup> second to 00 seconds each minute a 24vdc pulse is transmitted to the secondary clocks. From the 44<sup>th</sup> minute through the 34<sup>th</sup> minute the pulse is transmitted on both the A and B lines. From the 35<sup>th</sup> minute to the 44<sup>th</sup> minute the pulse is transmitted on the A line only. Clocks which are fast and reach the 44<sup>th</sup> minute ahead of the master will stop since, at this time, they will respond only to pulses transmitted on the B line. During the 44<sup>th</sup> minute from 10 seconds through the 50<sup>th</sup> second a total of 20 rapid pulses are transmitted at a 0.5 Hz rate on the A line to advance all slow clocks.

Manual clock advances and daylight saving advances cause the unit to transmit 62 pulses (1 second ON and 1 second OFF - at 0.5Hz rate). The first five of these pulses are transmitted on both lines A and B. The remainder of the pulses are transmitted on Line A only. Normal minute pulses are inhibited during these pulses.

ENTER SECONDARY SELECTION CODE 20

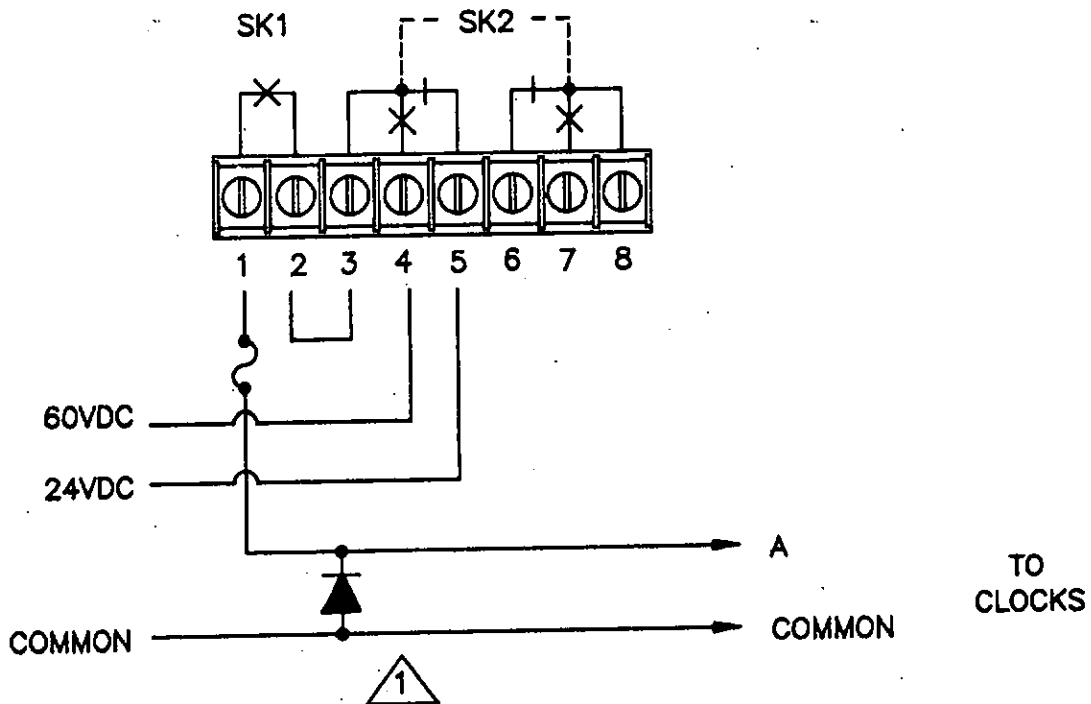


# CINCINNATI D-1

Each minute from HH:MM:58 to HH:MM:00 relay SK1 is activated causing an output on line A for 2 seconds. During minutes 07 through 58 only relay SK1 activates causing the output on Line A to be 24VDC. During minutes 59 through 06 relay SK2 is also activated, together with relay SK1, causing the output on line A to be 60VDC to advance all clocks. Clocks which are fast and reach the 59<sup>th</sup> minute ahead of the master will stop since, at this time, they will respond only to the 60VDC pulses.

Hourly corrections occur during minute 59 from HH:59:10 through HH:59:49. During hourly corrections a total of 20 rapid pulses of 24VDC are output on line A (at .5 Hz rate) causing all slow clocks to rapidly advance. All secondaries at minutes 59, 00 or 01 will not respond to the 24VDC but hold until the 60VDC signal to advance. Manual clock advances cause a total of 62 pulses on the A line, the first five are 60VDC and the remainder are 24VDC.

ENTER SECONDARY SELECTION CODE 21

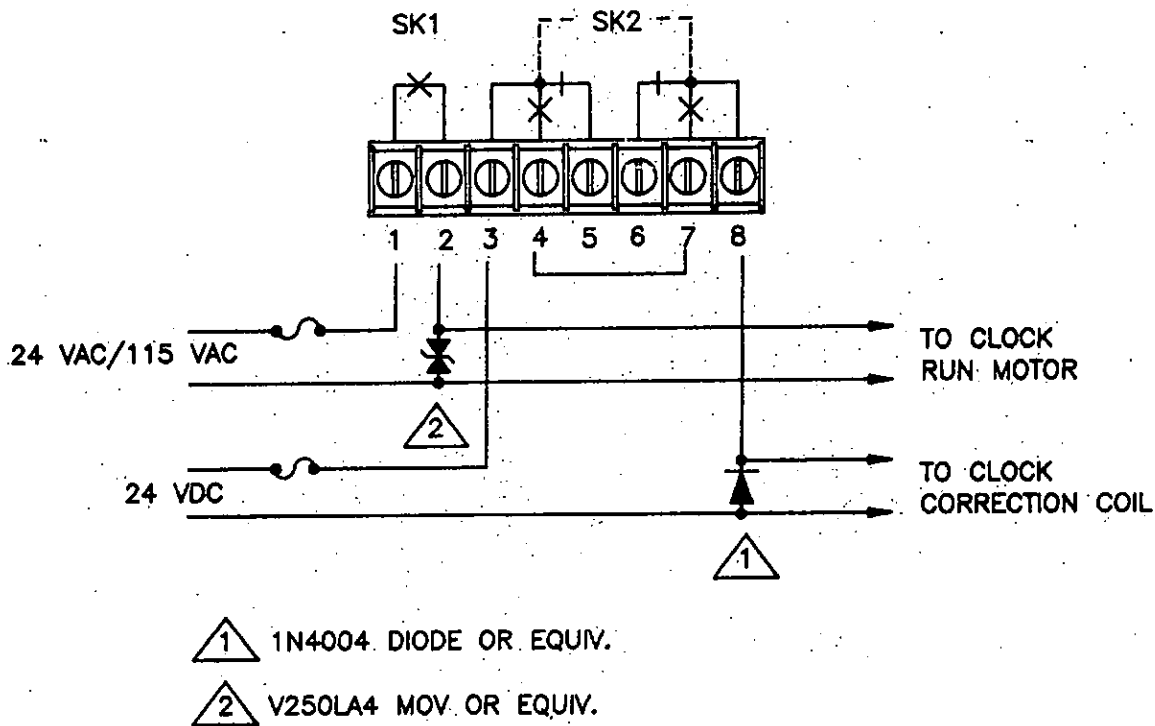


1 1N4004 DIODE OR EQUIV.

# DUKANE SYNCHRONOUS WIRED

During normal operation power (either 24VAC or 115VAC) is furnished to the clock run motor through relay SK1. Power is removed from the run motor during power failures and while SK1 de-energizes during Fall Daylight Savings changes. Each hour from X:57:00 to X:57:55 relay SK2 energizes to furnish a 24VDC signal to the correction coil. This 55 second signal causes all secondaries to advance to the 58<sup>th</sup> minute thus synchronizing the seconds and minutes with the master. The 12 hour correction occurs twice daily beginning at 5:59:00. Every other minute from 5:59:00 through 6:19:55 relay SK2 energizes to furnish eleven 55 second 24VDC signals to the clock correction coils (i.e. 5:59:00 to 5:59:55, 6:01:00 to 6:01:55, . . . , 6:19:00 to 6:19:55). These eleven signals cause all secondaries, that are within 11 hours behind, to advance to 5:58:00. Hours, minutes and seconds will be synchronized to the master after the next hourly correction (at 6:58:00). Clocks that were more than 11 hours behind, previous to 12 hour correction, must require two 12 hour corrections to advance to 5:58:00.

## ENTER SECONDARY SELECTION CODE 22



## CONDOR DIGITAL CLOCKS (Model 2412)

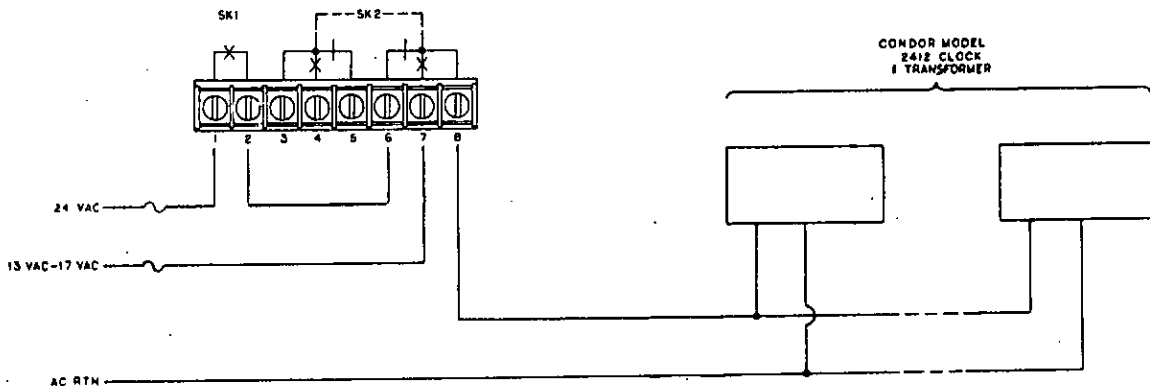
The Condor digital clocks initialize to 12:00AM when power is first applied. During normal operations the clocks maintain time by counting the 60 Hz AC line frequency. When the line voltage drops low, approximately two thirds normal level, the digital clocks will start rapidly advancing at a rate of two minutes per second. After applying power to the master and entering system selection code 23, the master will initialize to 12:00AM.

Each twelve hours at 11:59:56AM and 11:59:56PM the master will drop SK1 removing power from the clocks. At 00 seconds SK1 starts operating again to apply full power to the clocks causing them to synchronize and correctly display 12:00.

After a time reset, manual clock advance, daylight saving changes, and power failures the master will drop SK1 at the following 56TH second to disconnect power to the clocks. At 00 seconds SK1 again operates for one second to apply full power to the clocks causing them to display 12:00. At 02 seconds SK1 is dropped and SK2 simultaneously operates to furnish low voltage to the clocks causing them to fast advance at a rate of 2 minutes per second. When the new time is reached, SK2 is dropped and SK1 is operated furnishing full power to be applied to the clocks for normal operation to presume.

If for any reason the digital clocks become unsynchronized with the master, then re-synchronization can be accomplished via mode 3 (key 7, manual clock advance).

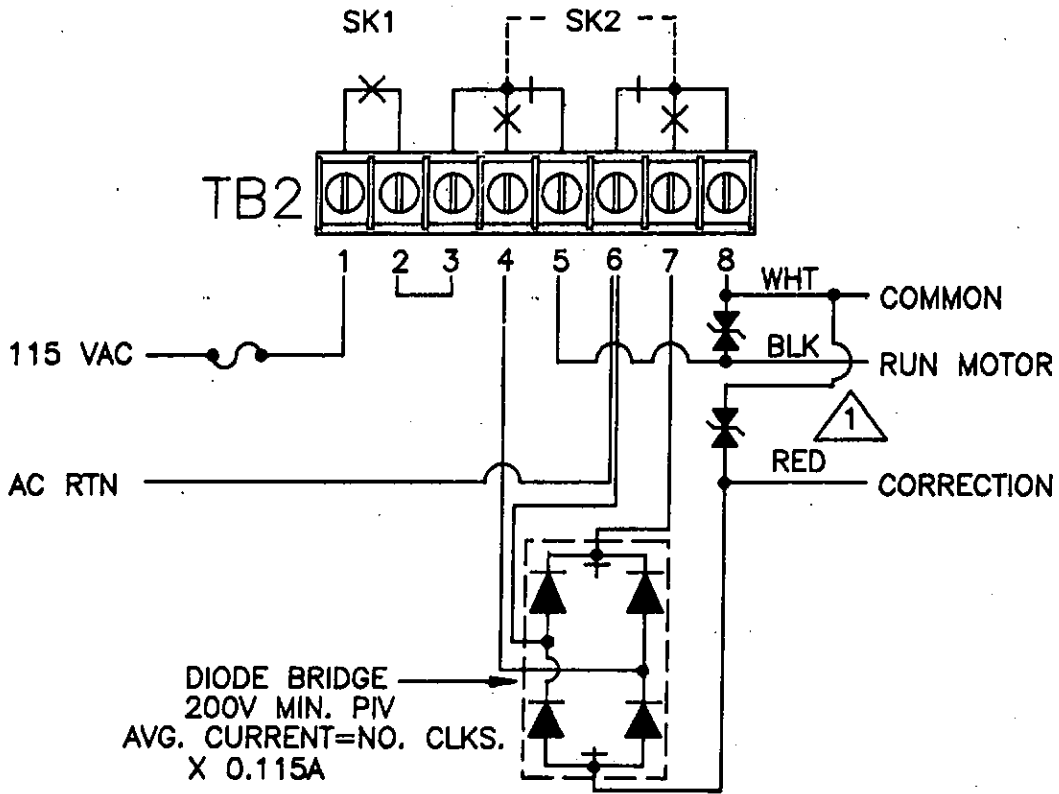
### ENTER SECONDARY SELECTION CODE 23



# EDWARDS SYNCHRONOUS WIRED CLOCKS - TYPE E-1

During normal operation, a 115VAC is applied between the run motor and common lines to operate the clocks until the 58TH minute. At HH:58:00 of each hour the 115VAC is replaced by 115VDC between the correction and common lines for a period of 200ms with the common line being positive. This pulse initiates hourly corrections to correct clocks which are less than 60 minutes slow. At 5:58:09 AM and PM an additional 115 VDC 200ms pulse is transmitted to cause correction of clocks which are slow 60 minutes or more.

ENTER SECONDARY SELECTION CODE 24



1 V250LA4 MOV OR EQUIV.

## LATHEM ONE YEAR LIMITED WARRANTY

This Lathem product is warranted against defects in material and workmanship for a period of one year from date of original purchase. The conditions of this warranty and the extent of the responsibility of Lathem Time Corporation ("Lathem") under this warranty are as follows:

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2. This warranty does not apply to any product which has been subject to abuse, neglect or accident, or which has had the serial number altered or removed, or which has been connected, installed, adjusted or repaired other than in accordance with instructions furnished by Lathem.
3. This warranty does not cover dealer labor cost for removing and reinstalling the machine for repair, or any expendable parts that are readily replaced due to normal use.
4. The sole responsibility of Lathem under this warranty shall be limited to repair of this product, or replacement thereof, at the sole discretion of Lathem.
5. If it becomes necessary to send the product or any defective part to Lathem or any authorized service dealer, the product must be shipped in its original carton or equivalent, fully insured, with shipping charges prepaid. Lathem will not assume any responsibility for any loss or damage incurred in shipping.
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9. Should any difficulties arise with the performance of this product during warranty, or with any Lathem authorized service centers, contact:

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