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 2-384, LTR 4-384, LTR 6-384

CONTENTS

Introduction		Page 1
Specifications		Page 1
Schematics:		
Complete Assembly		Page 2
Door Assembly		Page 3
Final Power-Up Procedure		Page 4
Program Instructions		
PREVIEW		Page 4
MODE 1	Set Time	Page 5
MODE 2	Set Day	Page 6
MODE 3	Manual Circuits (Includes manual clock advance)	Page 6
MODE 4	Program Circuits	Pages 7 - 9
MODE 5	Set Duration	Page 9
MODE 6	Enable Circuits	Page 10
MODE 7	Daylight Saving	Page 10
MODE 8	Schedule Select	Page 11
Wiring Diagrams		
Signal Devices (Bells or Horns)		Appendix A
Secondary Clocks - (Available on Standard F Version EPROMS)		Appendix A
Secondary Clocks - (Available on G Version EPROMS)		Appendix B
Secondary Clocks - (Available on H Version EPROMS)		Appendix C

Printed in USA

INTRODUCTION:

Each unit consists of two printed circuit boards contained in a semi-flush or optional surface mount container (models with "-S" suffix are furnished for surface mounting). 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 front panel. 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 and displaying of data. A switch, located on the back of the door assembly, prevents unauthorized data entry while in the ON position.

The unit is capable of operating various types of secondaries as described in the appendix sections of this manual. Installer selects the type secondary to be operated by entering a two digit secondary selection code number which corresponds to the secondary clock system to be operated. This code is entered one time only, during the power-up procedure. See the appendix sections of this manual for the appropriate selection code.

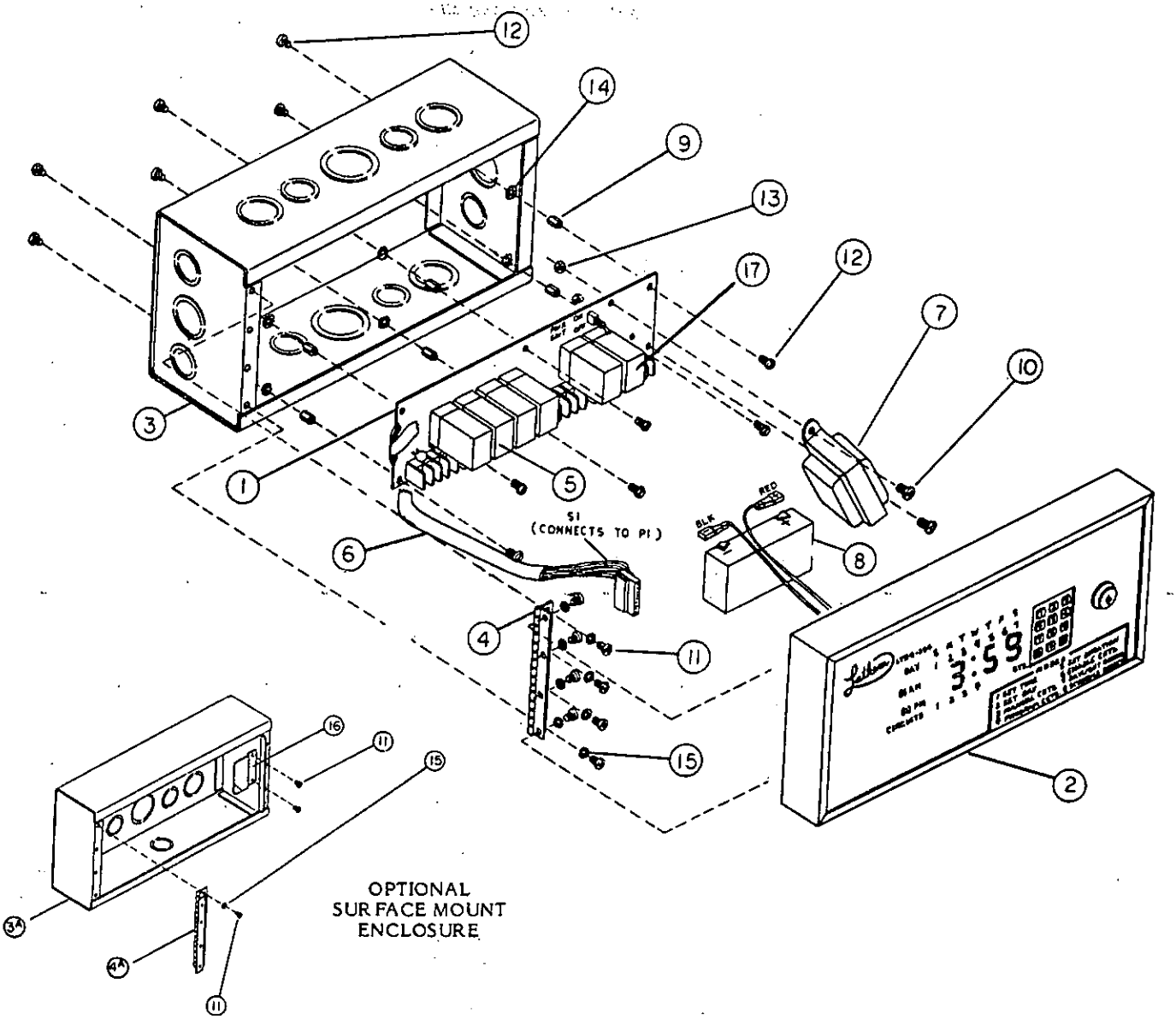
The timekeeping ability is independent of the power source frequency due to a quartz crystal time base. During A.C. power failures, lasting up to 7 days, the unit will continue to keep time and retain data, while a flashing colon indicates standby operation. Depending on the secondary selection code used at power-up, the unit accumulates the lost time during power fault and immediately generates clock advance signals when power resumes (see appendix section for further details). 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 disable all signal and secondary control relays. When this switch is in the OFF position, the unit goes onto standby battery operation as indicated by the flashing colon.

The LTR2-384 is equipped with two signal circuit relays, the LTR4-384 with four and the LTR6-384 with six. Each relay circuit can be wired to a seperate wire path for controlling signal devices in seperate areas of the facility. Three schedules, each containing up to 128 event, can be programmed for circuit operation. When seasonal schedules change, the appropriate schedule can be activated. Each of the 128 events (per schedule) includes the hour and minute, the day(s) of the week, and the desired circuit(s). Each circuit can be individually set for a duration from 1 to 99 seconds.

SPECIFICATIONS

Input Voltage	115Vac (220Vac Optional)
Input Frequency	60Hz or 50Hz (Standard)
Input Power	30VA Max
Standby Power	1.2Amp, 6V Gel Cell battery (Automatically recharged)
Standby Time	7 days
Bell Circuits	10Amp, double pole relay contacts (Pluggable)
System Clock Circuits	10Amp, double pole relay contacts (Pluggable)
Temperature Range	32° - 140°
Voltage Range	±10%
Shipping Weight	12 pounds
Dimensions:	
Semi-Flush Mount (Installed)	13 1/2" w X 6 1/2" h X 2 1/2" d
Backbox Flush	12" w X 6" h X 4" d
Surface Mount	13 1/2" w X 6 1/2" h X 4 1/2" d
Backbox Surface	13 1/2" w X 6 1/2" h X 3" d

COMPLETE ASSEMBLY OF MODELS LTR 2-384, LTR 4-384, AND LTR 6-384

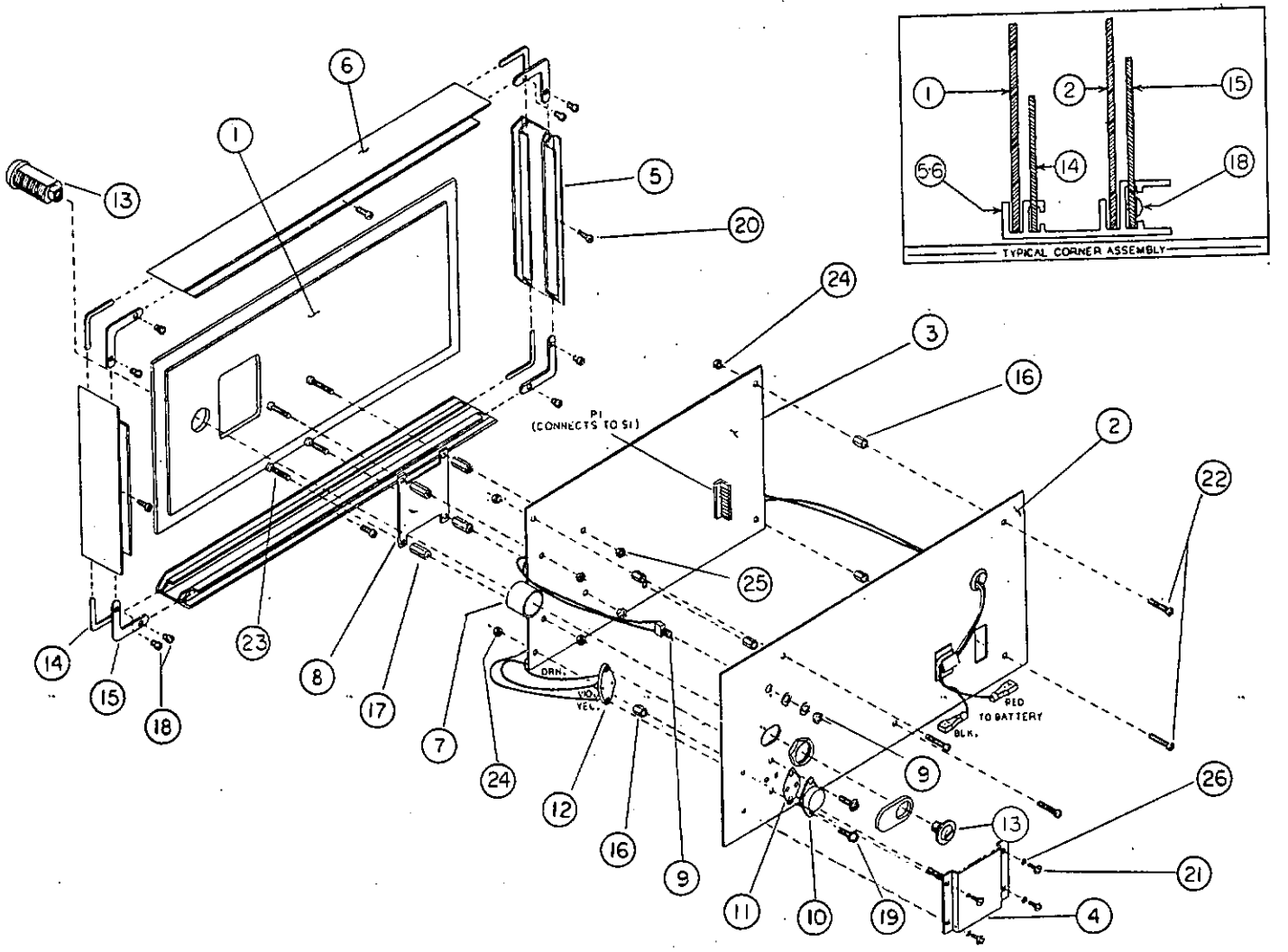


OPTIONAL
SURFACE MOUNT
ENCLOSURE

NO.	PART NO.	PART NAME
1.	DPT-4008 ASSY	Relay/Power Supply Board
2.	DPT-4010 ASSY	Door Assembly (Complete)
3.	DPT-4012	Enclosure (Semi-Flush)
3A.	DPT-4012-A	Enclosure (Surface)
4.	DWA-3306	Hinge (Semi-Flush)
4A.	DWA-3306-A	Hinge (Surface)
5.	VII-0002	Relay (Bell Circuit: 2, 4, or 6 each)
6.	CAI-0003	Shielded Cable
7.	VIE-0058	Transformer
8.	NP1.2-6	Battery (6V, 1.2 AH)

NO.	PART NO.	PART NAME
9.	AL-6950-0440	Hex Spacer (6)
10.		8-32 x 1/4 Phillips, Pan Head Machine Screw (2)
11.		6-32 x 1/4 Phillips, Pan Head Self-Tapping Screw (8)
12.		4-40 x 3/16 Slotted, Binder Head Machine Screw (12)
13.		8-32 Hex Nut (2)
14.		#4 Star-Lok (6)
15.		#6 Star-Lok (8)
16.	DPT-4030	Lock Keeper
17.	VII-0002	Relay (Clock Relay: 2)

DOOR ASSEMBLY FOR MODELS LTR 2-384, LTR 4-384, AND LTR 6-384



NO.	PART NO.	PART NAME
1.	DPT-4002-1	Front Panel
2.	DPT-4004-1	Display Mask Panel
3.	DPT-4006-1 ASSY	CPU and Display Board
4.	DPT-4014	Regulator Shield
5.	DWA-3308	Door Frame (Left and Right)
6.	DWA-3310-1	Door Frame (Top and Bottom)
7.	MC-2067	Lock Barrel Spacer
8.	KEA4A-906	Keypad
9.	TT13A-9T-1/4	Keypad Security Switch
10.	LM317K	Voltage Regulator
11.	8038-3P1	Insulator
12.	8081-G4	Regulator Mount
13.	VAM-0001	Lock Assembly
14.	VIM-0014	Angle Spacer (4)
15.	VIM-0015	Angle Mounting Brace (4)

NO.	PART NO.	PART NAME
16.	AL-6950-0440	Hex Spacer (5)
17.	AL-6950-0256	Hex Spacer (4)
18.		8-32 x 1/8 Slotted, Binder Head Machine Screw (8)
19.		6-32 x 1/2 Phillips, Pan Head Machine Screw (2)
20.		6-32 x 1/4 Phillips, Fillister Head Self-Tapping Screw (4)
21.		6-32 x 3/16 Phillips, Pan Head Self-Tapping Screw (4)
22.		4-40 x 1/2 Slotted, Pan Head Machine Screw (5)
23.		2-56 x 1/2 Slotted, Pan Head Machine Screw (4)
24.		4-40 x 3/16 A.F. Hex Nut (5)
25.		2-56 x 3/16 A.F. Hex Nut (4)
26.		#6 Star-Lok (4)

FINAL POWER-UP PROCEDURE

1. Wire according to the diagrams shown in the Appendix sections. Be certain to install the provided MOV's and the in-line fuses, as illustrated, to prevent damage from line shorts. If line noise is suspected, filtering primary power is recommended.
2. Connect power to terminal block TB3 (refer to pages 2 and a-1).
3. Set power switch, located on circuit board inside backbox, to the ON position.
4. Mate battery connectors (Red to Red, Black to Black).
5. Set security switch, located on back of door assembly, 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: Special models furnished with the G or H version EPROMS will display "1 _0" or "2 _0" at power-up, respectively.) This is a prompt for the operator to key in the two digit system selection code identifying the type of secondary clock to be operated. Refer to appendix A for selection codes pertaining to standard models using F Version EPROMS. Refer to appendix B for G version or appendix C for H version EPROMS. Once entered, the code cannot be changed except by resetting the power switch to the OFF position and disconnecting the battery connectors to clear all data in memory, then reconnecting and starting again.

PREVIEW

Step 1.	Press (#)	Press the (#) key to indicate that a mode selection follows.
Step 2.	Select (1) - (8)	Press the number key that corresponds to the desired mode:
		(1) Set Time
		(2) Set Day
		(3) Manual Circuits (and Manual Clock Advance)
		(4) Program Circuits
		(5) Set Circuit Duration
		(6) Enable Circuits
		(7) Daylight Saving
		(8) Schedule Select
Step 3.	Press (#)	Press the (#) key to enter the selected mode.
NOTE:	Abort Key (*)	Press the (*) key while programming to abort the current instructions and return to the normal operating mode.

REFER TO THE FOLLOWING PAGES FOR A DESCRIPTION OF EACH MODE.

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 11:11 AM (except for entry codes of 07, 08, and 23).

The key sequence is as follows:

Step 1.	Press (#)(1)(#)	Select SET TIME mode 1. The screen will display a cursor followed by three zeros, "_0:00". The AM/PM indicator will blank and the colon become fixed (not flashing).
Step 2.	Enter Time	Enter all four digits of the current time (hour and minute) using leading zeros. For example, if the time is less than 10:00, enter (0) as the first digit [at 9:30 enter (0)(9)(3)(0)]. Enter each digit noting the cursor position marking the next digit to be entered, until all four digits have been entered. At this time, the AM/PM indicators will light.
Step 3.	Select AM/PM	Press the (0) key to select PM and extinguish the AM indicator. Press the (1) key to select AM and extinguish the PM indicator. Failure to select either AM or PM will cause the unit to default to AM.
IMPORTANT		NOTE: Check to be sure that the correct time is displayed before continuing, if not, press any number key and continue at step 2 above. To abort Set Time mode without entering new data, press the (*) key before continuing to step 4.
Step 4.	Press (#)	Press the (#) to enter 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.

EXAMPLE: Set the time to 2:45 PM:

[#][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. The seven LEDs above the time display indicate the current day of the week. Each LED represents a day of the week, Sunday (1) through Saturday (7). At initial power-up, the day initializes to a non-selected condition. A day must be selected for automatic signal operation.

The key sequence is as follows:

Step 1.	Press (#)(2)(#)	Select SET DAY mode 2. All seven LEDs, indicating the days of the week Sunday (1) through Saturday (7) will light.
Step 2.	Select (1) - (7)	Any key entry of (1) to (7) will light the corresponding LED and extinguish the remaining six. A key entry of (8), (9), or (0) will relight all seven LEDs for reentry.
Step 3.	Press (#)	Press the (#) key to enter the day of the week into memory. The unit will return to normal time display, with the LED for the selected day lit.

EXAMPLE: Set clock day to Tuesday:

[*] [#][2][#] [3][#]

MODE 3 MANUAL CIRCUITS (and Manual Clock Advance)

Any signal circuit can be manually activated using mode 3. The security switch may be ON for manual signal control, but must be OFF for manual clock advance.

The key sequence is as follows:

Step 1.	Press (#)(3)(#)	Select MANUAL CIRCUITS mode 3. The circuit LEDs below the time display will light.
Step 2.	Select (1) - (7)	This step is not necessary if all bell circuits are to be operated. Select circuits by pressing each key corresponding to the circuit number (1) through (6). The circuit LEDs will light upon their selection. Press (0) to extinguish all circuit LEDs for reselection. Pressing the (7) key will light the system LED and extinguish all circuit LEDs. Use this selection to advance secondary clocks (not operative if security switch is ON).
Step 3.	Press (#)	Press the (#) key to activate the selected circuits. Operation of the circuits will be indicated by the blinking of the corresponding circuit LEDs. If circuit reselection is desired, repeat step 2. If (7) was selected in step 2, pressing the (#) key in step 3 will revert operation to normal and light the "SYS" light until clocks advance.
Step 4.	Press (*)	To exit Manual Circuits mode and return to normal clock operation.

EXAMPLE: Signal circuits 1 and 4 manually: [*] [#][3][#] [1][4][#] (Hold) [*]

Advance secondary clocks: [*] [#][3][#] [7][#]

MODE 4 PROGRAM CIRCUITS

Security Switch must be OFF to access.

The schedules can be edited and reviewed in this mode. Events need not be entered chronologically, however bell schedules are reviewed chronologically backward or forward.

The key sequence is as follows:

Step 1.	Press (#)(4)(#)	Select PROGRAM CIRCUITS mode 4. A "1" will appear on the display indicating schedule 1 selection.
Step 2.	Select Schedule	Select (1)-(7) corresponding to the desired schedule.
Step 3.	Press (#)	Enter schedule selected in step 2. If data has previously been entered for this schedule, the first event will display on screen, showing 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 has been entered and a scheduled event is displayed on the screen, press the (6) key to display a new entry position (cursor followed by three zeros).
Step 2.	Enter Time	Enter all four digits of the time (hour and minute) using leading zeros. If the time is less than 10:00, enter (0) as the first digit [Example: for 9:30 enter (0)(9)(3)(0)]. Enter all four digits, noting the cursor position marking the next digit to be entered. After all four digits are entered, the AM/PM LEDs will light.
Step 3.	Select AM/PM	Press (0) to select PM or (1) to select AM. The other number keys are not active. No selection will enter both AM and PM and result in 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 number key and continue at step 2 above.
Step 4.	Press (#)	Enter the time data by pressing (#). All seven day LEDs will light.
Step 5.	Select Days	Any key from (1) to (7) will select its respective day for bell actuation. Press (8), (9), or (0) to relight all 7 LEDs. If a day selection is not made, the next (#) key will select "every day".
Step 6.	Press (#)	Enter the day selection by pressing the (#) key. All six circuit LEDs will light.

(a) Data Entry - Continued

Step 7. Select Circuit(s)	Skip this step if all circuits are to be selected. Any numeric key between (1) and (6) will select its respective circuit and extinguish all other circuit lights. Pressing (0) will extinguish all circuit lights. After the correct circuit(s) are selected, proceed to step 8.
Step 8. Press (#)	Enter the data by depressing the (#) key. All data entered in steps 2 through 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 2 if more data entries are desired. If this was the 128th 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. Acuation 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 an event on schedule 3 at 4:25PM, Mon/Wed/Fri, circuits 1&2:

[*] [#] [4] [#] [3] [#] [6] [0] [4] [2] [5] [0] [#] [2] [4] [6] [#] [1] [2] [#] [*]

(b) Scanning Existing Schedule

KEY (3) - Scan Backward	Press the (3) key to review the previous event in the schedule. Repeatedly pressing key (3) will scan, in reverse chronological order, to the first event of the day.
KEY (#) - Scan Forward	Press the (#) key to review the next event in the schedule. Repeatedly pressing key (#) will scan forward, in chronological order, to the last event of the day. 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) - First Event	Press the (9) key to review the first event of the day.

EXAMPLE: Enter Program Circuits Mode (4) for Schedule 1: [*] [#] [4] [#] [1] [#]

then Scan forward [#] [#] . . . [#] or Scan backward 3 3 . . . 3 [*]

(c) Editing Existing Schedule

KEY(1) Erase Event — To erase an event, scan through the schedule, using the (#) and (3) keys, until the event to be erased is displayed, then press (1). The event will be cleared from memory and "_0:00" will display. A new entry can be added if desired. If (1) is pressed with "_0:00" displayed, operation resumes at data entry step 2.

EXAMPLE: Erase a single event in schedule 1:

[*] [#][4][#] [1][#] [#][#] ... [#] scan to event [1] [*]

KEY (4) Erase Schedule — Pressing the (4) key will display "-- --". This is a warning that the schedule is about to be erased. Pressing the (#) key will cause all data in that schedule to be erased and result in a display of "_0:00" for new data entry. To avoid clearing of entire schedule, press any key other than (#) key while "-- --" is displayed.

EXAMPLE: Erase all events in schedule 2.

[*] [#][4][#] [2][#] [4][#] [*]

KEY (6) New Entry — Pressing the (6) key will display "_0:00" for new data to be entered (unles a total of 64 events have been entered). Proceed as described in Data Entry step 4.

EXAMPLE: Make a new data entry on schedule 2.

[*] [#][4][#] [2][#] [6] then follow data entry section a.

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

This mode is used to enter the signal duration (in seconds) for each circuit. At power up, all circuit durations default to 5 seconds.

Step 1. Press (#)(5)(#) — Select SET DURATION mode 5. The screen will display '1', identifying circuit 1, followed by a dash, '-', followed by two digits indicating the current signal duration for the displayed circuit.

Step 2. Select Circuit — Repeatedly press (#) until the desired circuit is displayed.

Step 3. Set Duration — Enter the duration (01) through (99), using leading zeros.

Step 4. Continue — If desired, press the (#) key to advance to the next circuit.

Step 5. Press (*) — To exit SET DURATION mode, press (*).

EXAMPLE: Set circuit 3 duration for 10 seconds:

[*] [#][5][#] [#][#] [1][0][#] [*]

MODE 6 ENABLE CIRCUITS Security switch must be OFF to access.

Circuits can be enabled or disabled in mode 6. Disable circuits so they will not signal during holidays, while output devices are being serviced, etc. All circuits are enabled at power-up.

The key sequence is as follows:

Step 1.	Press (#)(6)(#)	Select ENABLE CIRCUITS mode 6. The circuit indicator LEDs, located beneath the blanked time, will light.
Step 2.	Select (0) - (6)	Select the circuits to be enabled. Press (0) to extinguish all circuit LEDs (disable all circuits) or for reselection purposes. When the all circuits to be enabled are lit, continue to step 3.
Step 3.	Press (#)	Enter the selection by pressing the (#) key. The normal time will be displayed with the enabled circuits lit.

EXAMPLE: Enable circuits 1 and 2:

[*] [#][6][#] [1][2][#] [*]

MODE 7 DAYLIGHT SAVING Security switch must be OFF to access.

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

The key sequence is as follows:

Step 1.	Press (#)(7)(#)	Select DAYLIGHT SAVING mode 7. This will display a "0" and "1". NOTE: If daylight saving had been previously activated, either a "0" or "1" would display, indicating the prior selection.
Step 2.	Select (0) or (1)	Press (0) to set the secondaries back or (1) to set them forward on the following Sunday morning. Any other numeric selection will illuminate both the "0" and "1" for reselection. If a selection is not made, the daylight saving change is aborted and no clock corrections will take place.
Step 3.	Press (#)	Press (#) to enter the daylight saving selection. The display will return to normal time with the Mode 7 LED lit. This LED will extinguish after the time change occurs at 2:00AM Sunday morning.

EXAMPLE: Advance clocks forward on the following Sunday:

[*] [#][7][#] [1] [#]

MODE 8 **SCHEDULE SELECT** Security switch must be OFF to access.

One of the single 64 event signal schedules or combined 128 event signal schedules can be activated in mode 8. At power-up, schedule 1 is automatically activated.

The key sequence is a follows:

Step 1.	Press (#)(8)(#)	Select SCHEDULE SELECT mode 8. The current schedule number (0-9) will display on the screen.
Step 2.	Select (0)-(9)	Select the desired schedule to be made active. Schedules 1 through 7 are individual schedules. Schedule 0 activates both schedules 1 and 2, schedule 8 activates both schedules 3 and 4, and schedule 9 activates both schedules 5 and 6. Refer to the table below. The selected schedule will display upon pressing the schedule key. When the desired schedule is displayed, continue to step 3.
Step 3.	Press (#)	Enter the selection by pressing the (#) key. The normal time will be displayed and signal control will resume with the selected schedule.

EXAMPLE: Activate schedule 2:

[*] [#][8][#] [2][#]

MODE 8 SELECTION	ACTIVE SCHEDULE(S)	MAX. # OF EVENTS
1	1	64
2	2	64
3	3	64
4	4	64
5	5	64
6	6	64
7	7	64
0	1 & 2	128
8	3 & 4	128
9	5 & 6	128

APPENDIX A
For Use With F-9 Version EPROMS

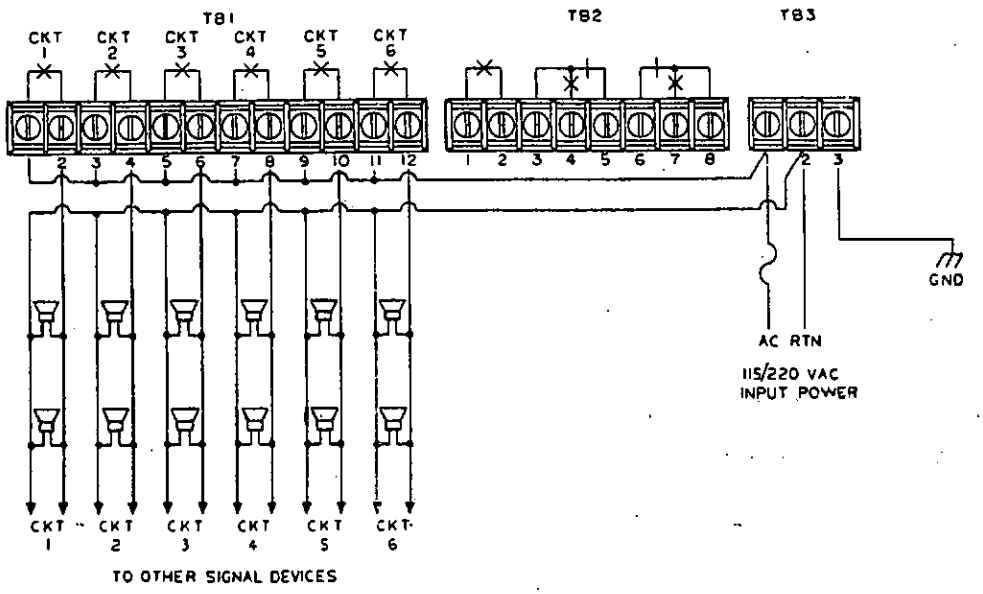
The following pages contain wiring diagrams necessary for the proper installation of secondary wall clocks and signal devices. CAUTION: Installation may present a shock hazard. Be certain to disconnect the A.C. power line before proceding and to avoid contacting foreign objects with circuit boards.

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 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 F version EPROMS are as follows.:

SELECTION CODE	TYPE SECONDARY	REFERENCE PAGE
01	3-Wire Synchronous (59th Min.)	a-2
02	3-Wire Minute Impulse (59th Min.) Hourly	a-3
02	2-Wire Minute Impulse (59th 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 (58th 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 59th Minute Dual Motor	a-13
10	Simplex 45th 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.

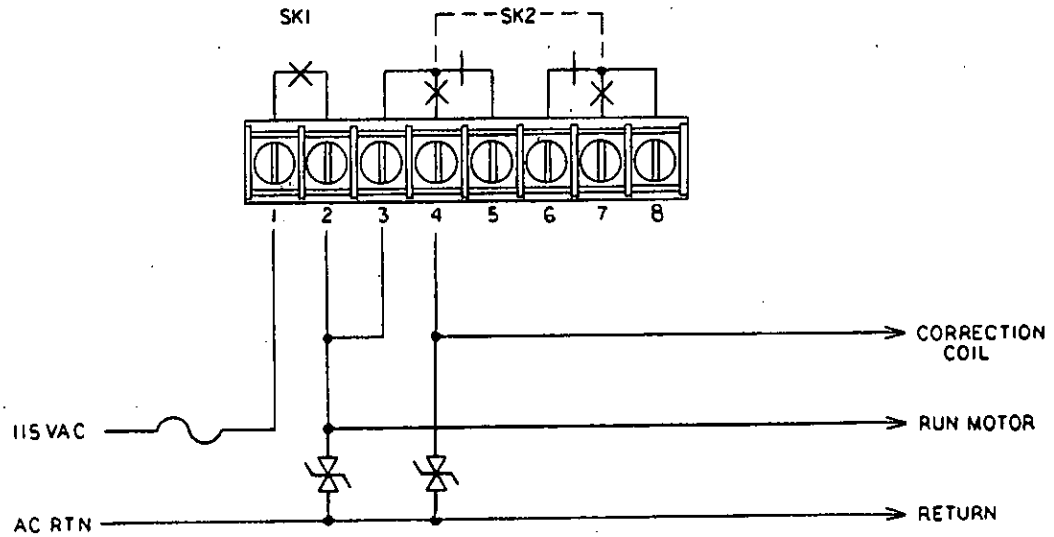
SYNCHRONOUS WIRED

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

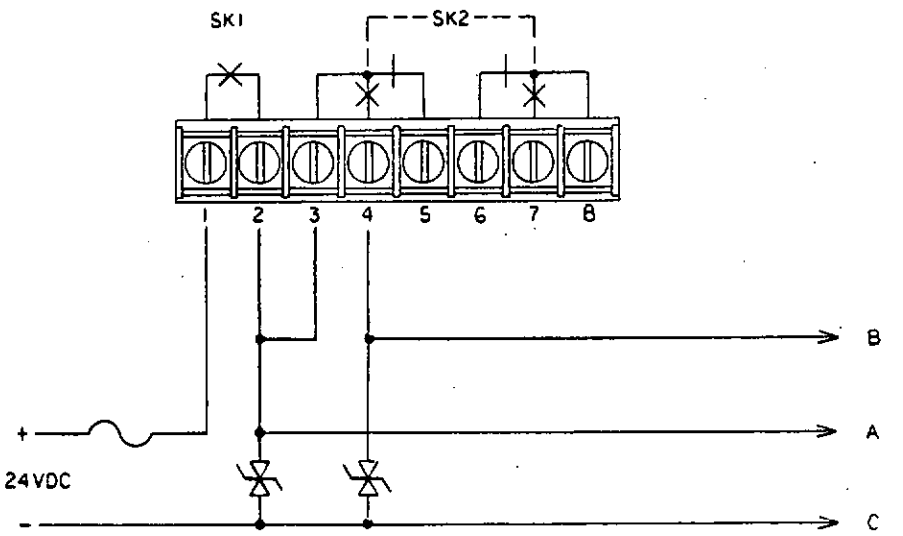
An accumulator, designed in the software, counts the number of minutes lost due to power failure. Upon resumption of power, the master transmits pulses on both lines A and B to immediately advance the slow clocks to proper time. Resetting time following a power failure will terminate these correction 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 58th second to 00 seconds each minute a 24vdc pulse is transmitted to the secondary clocks. From the 59th minute through the 49th minute the pulse is transmitted with line AB positive with respect to PC. From the 50th minute to the 59th minute the pulse is transmitted with line AB negative with respect to PC. Clocks which are fast and reach the 59th 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 59th minute from 10 seconds through the 50th 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.

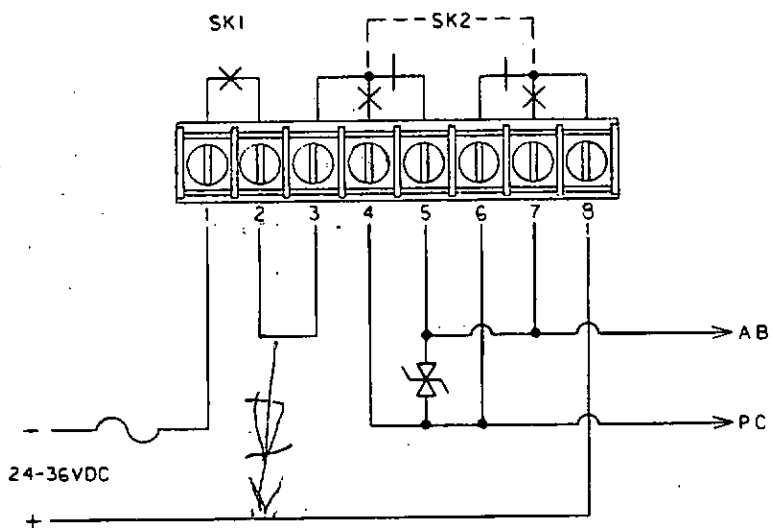
An accumulator, designed in the software, counts the number of minutes lost due to power failure. Upon resumption of power, the master transmits pulses with line AB positive with respect to PC to immediately advance the slow clocks to proper time. Resetting time following a power failure will terminate 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	Type ISC (2-Wire)
Cincinnati Model	D3

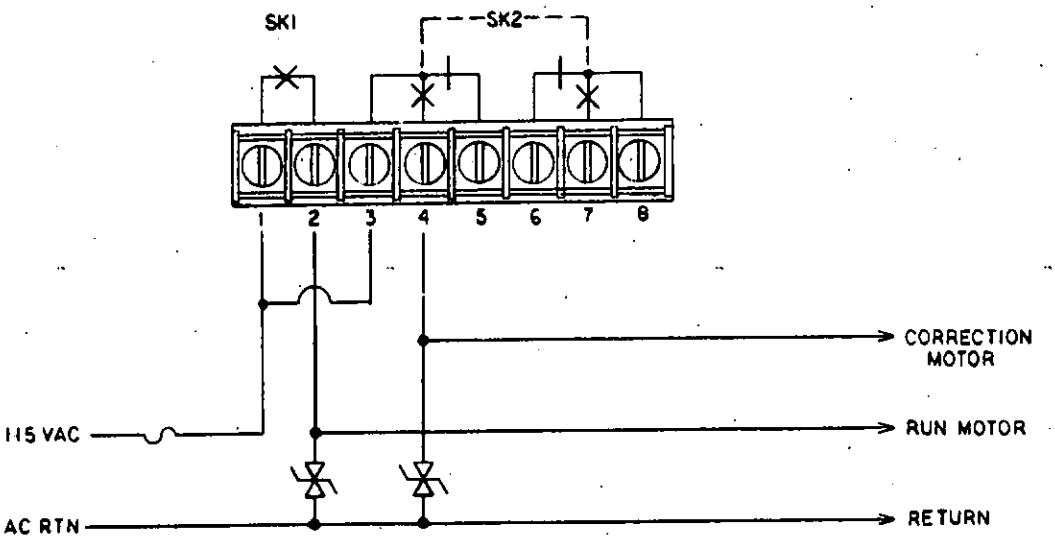
ENTER SECONDARY SELECTION CODE 02



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 5:15:00 to 5:30:00. 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

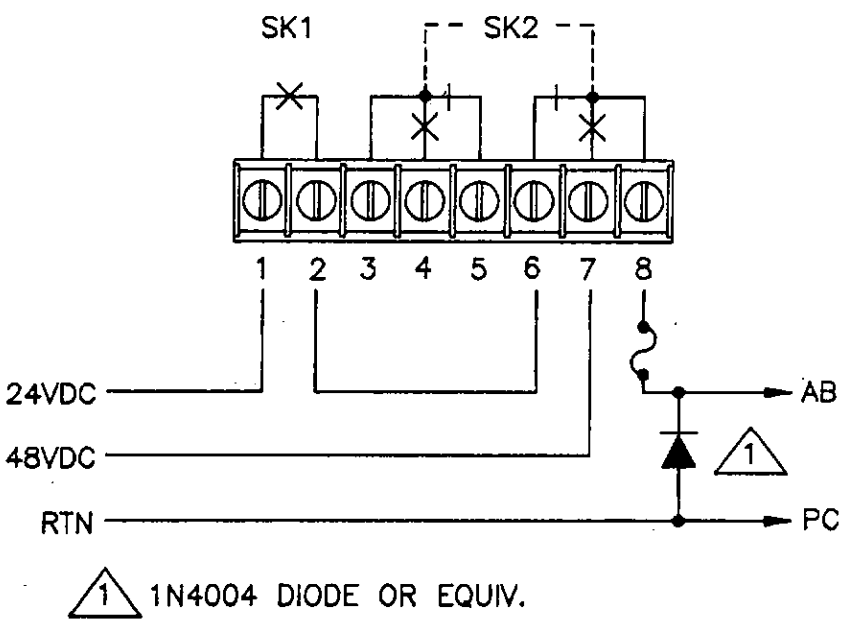


STANDARD ELECTRIC TIME AR-2A TWO WIRE DUAL VOLTAGE

Each minute from 58" to 00" a pulse of low voltage (24VDC) will be transmitted . The secondary clocks will receive the pulses until the 59th 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

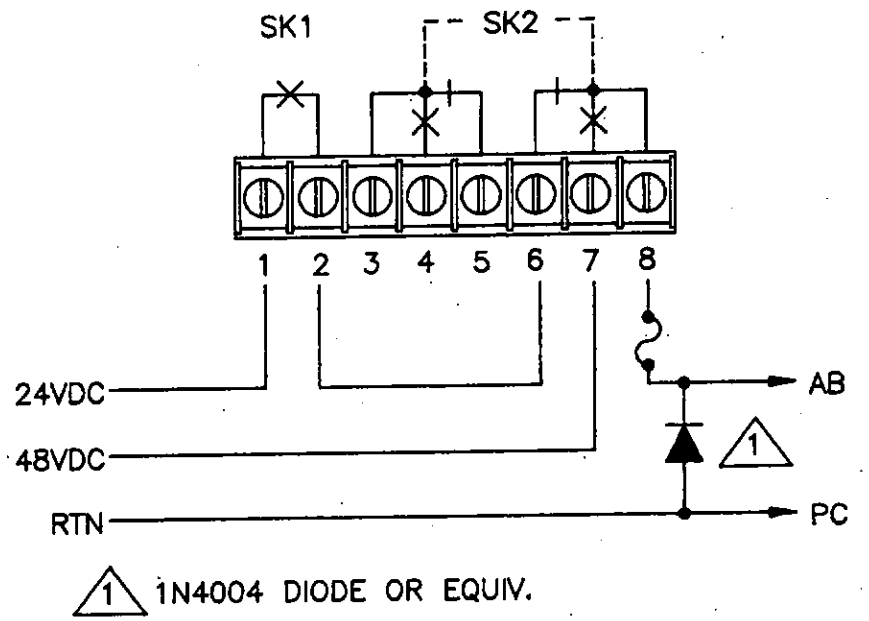


STANDARD ELECTRIC TIME AR-2 TWO WIRE DUAL VOLTAGE

Each minute from 58" to 00" a pulse of low voltage (24VDC) will be transmitted . The secondary clocks will receive the pulses until the 58th 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



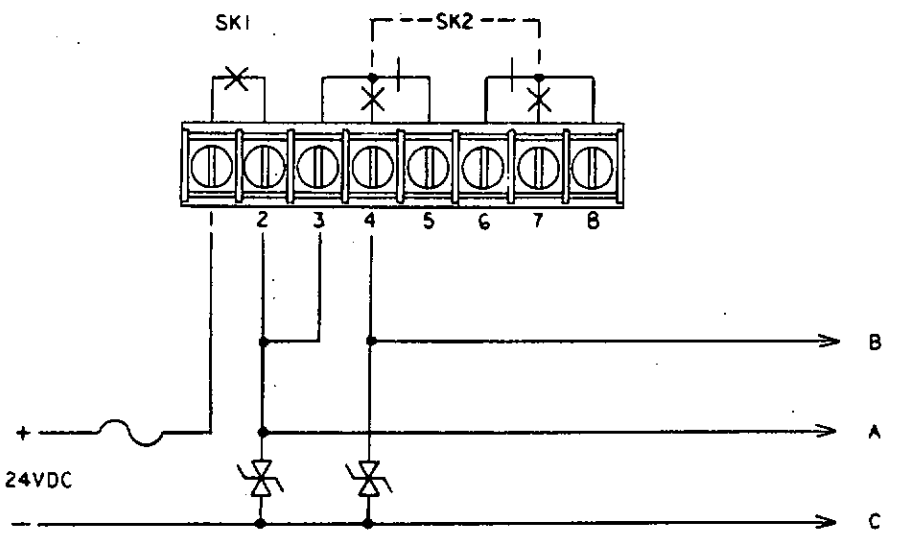
THREE WIRE MINUTE IMPULSE (58TH MIN.)

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



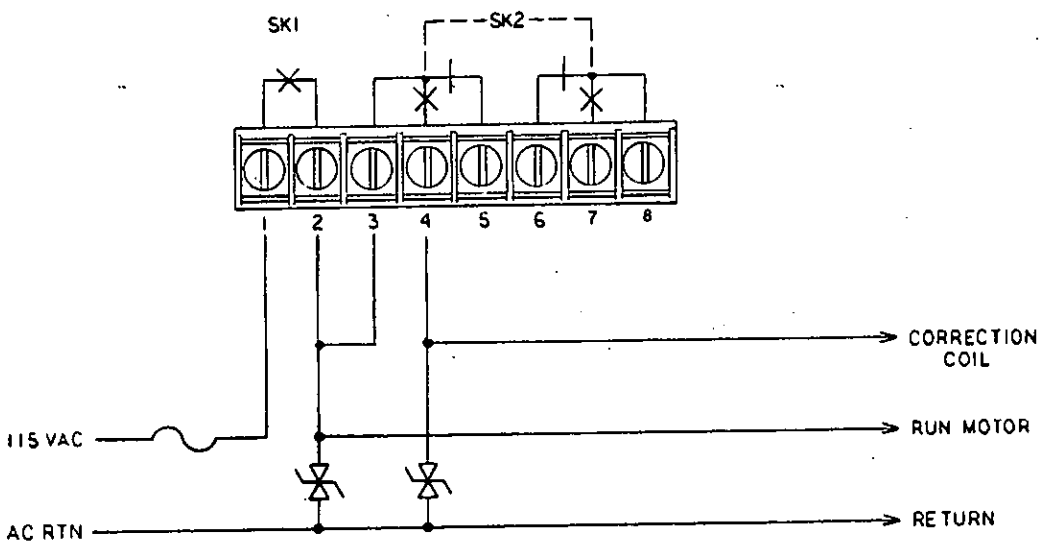
SYNCHRONOUS WIRED

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

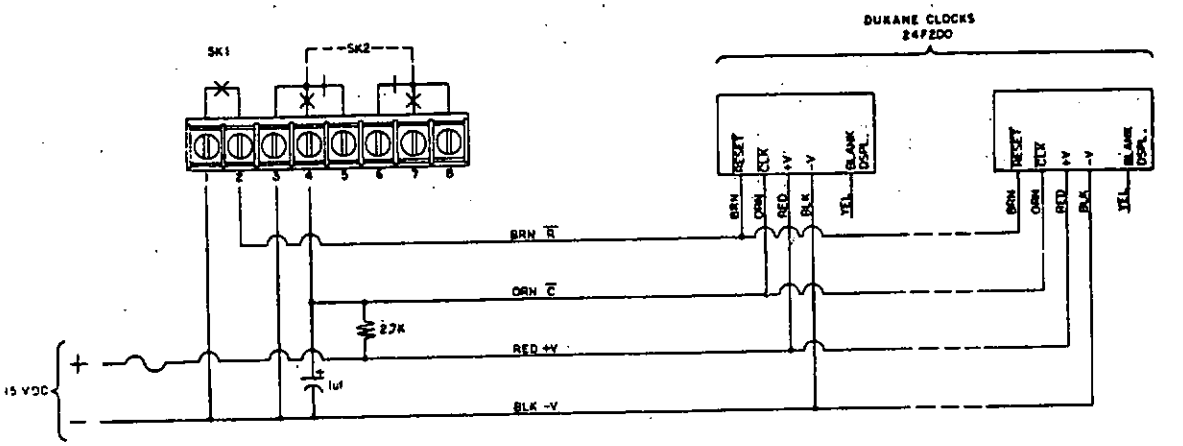
ENTER SECONDARY SELECTION CODE 06



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^{th} second the digital clocks will reset to 0:00 and then at the 59^{th} 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.

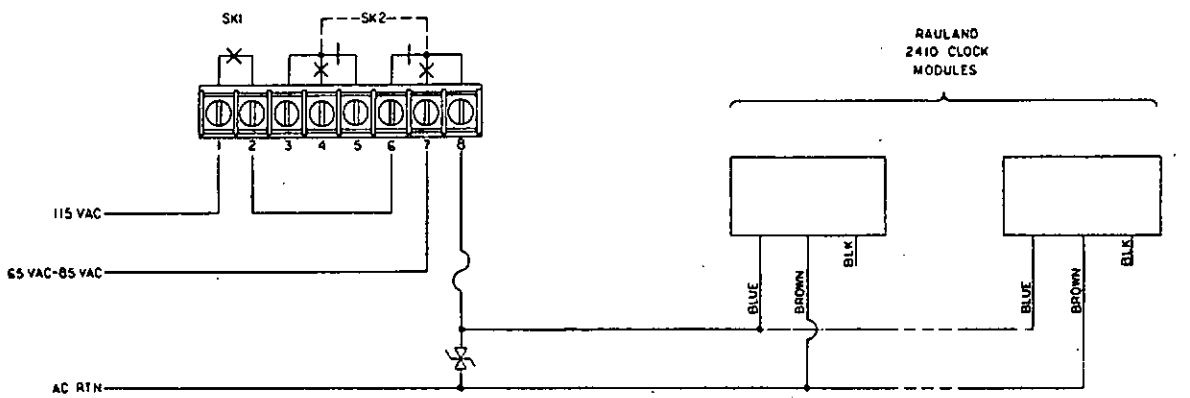
ENTER SECONDARY SELECTION CODE 07



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 56th second the the master will remove power from the digital clocks and then at the 59th 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 56th second power will be removed and a low voltage applied at the 59th 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.

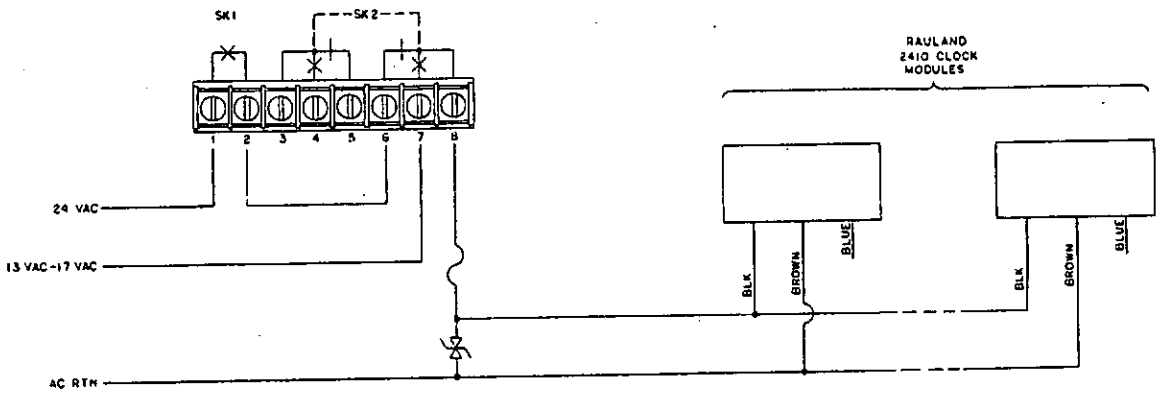
ENTER SECONDARY SELECTION CODE 08



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 56th second the the master will remove power from the digital clocks and then at the 59th 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 56th second power will be removed and a low voltage applied at the 59th 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.

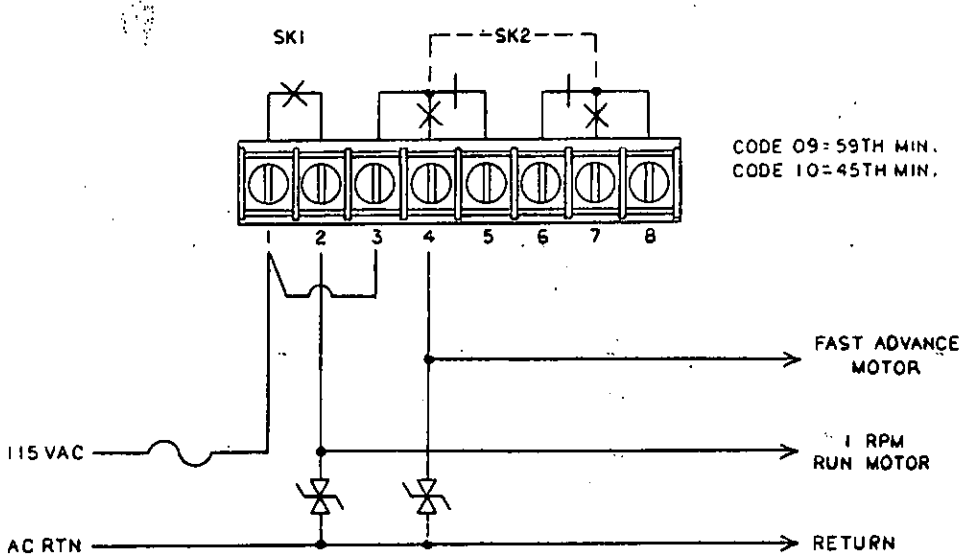
ENTER SECONDARY SELECTION CODE 08



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.

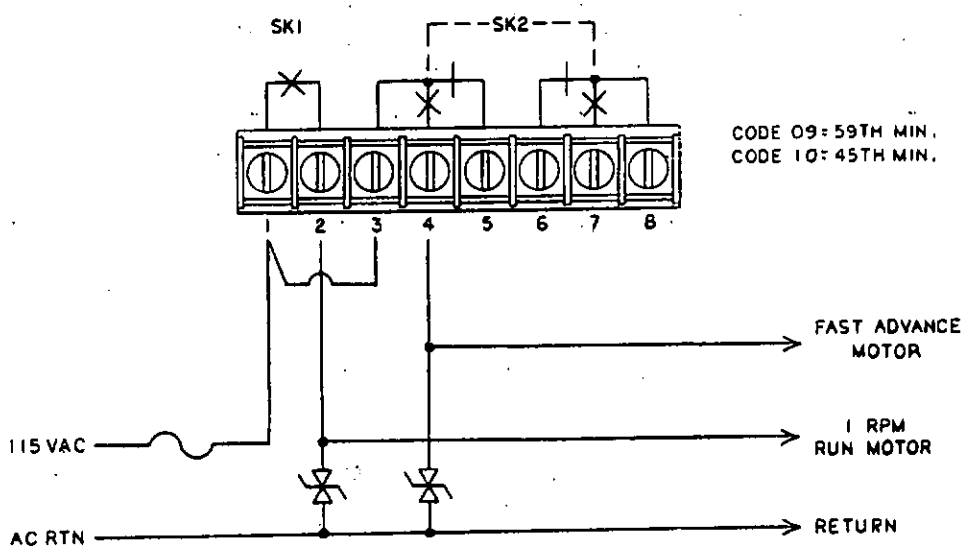
ENTER SECONDARY SELECTION CODE 09



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.

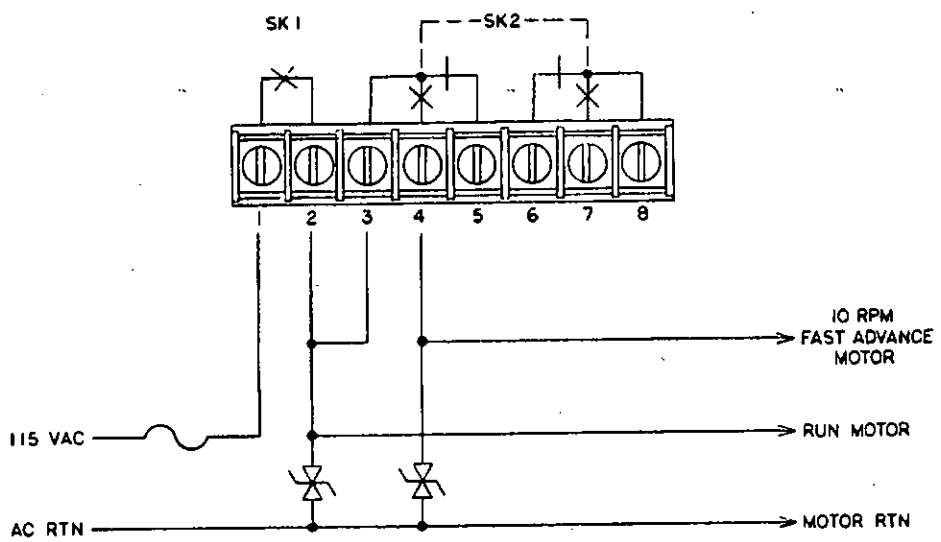
ENTER SECONDARY SELECTION CODE 10



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.

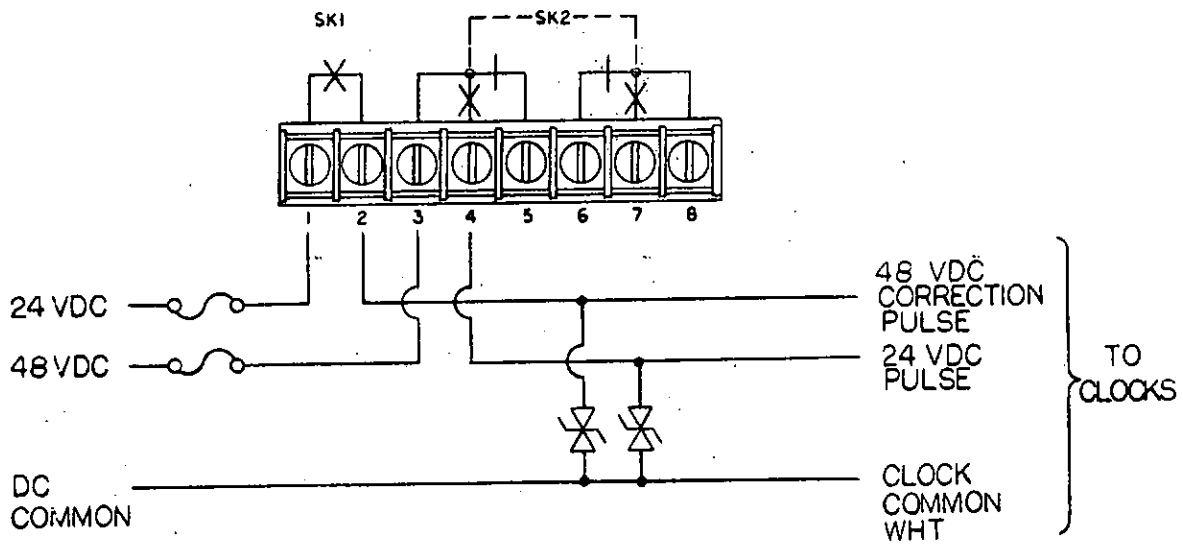
ENTER SECONDARY SELECTION CODE 11



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 58th minute. At this time from 50" to 00" a pulse on line B will be required to advance to the 59TH 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 proceding 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 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 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

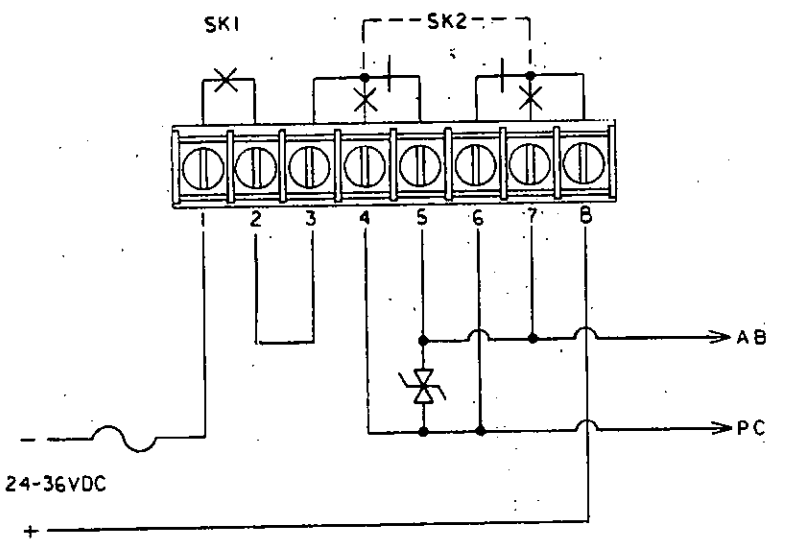
G-9 EPROM

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 occuring at a 0.5hz rate are transmitted on lines A&C, line C positive with respect to line A, during the 59th minute of each hour from second 10 through second 50. To provide twelve hour corrections, 20 rapid pulses occuring 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 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.

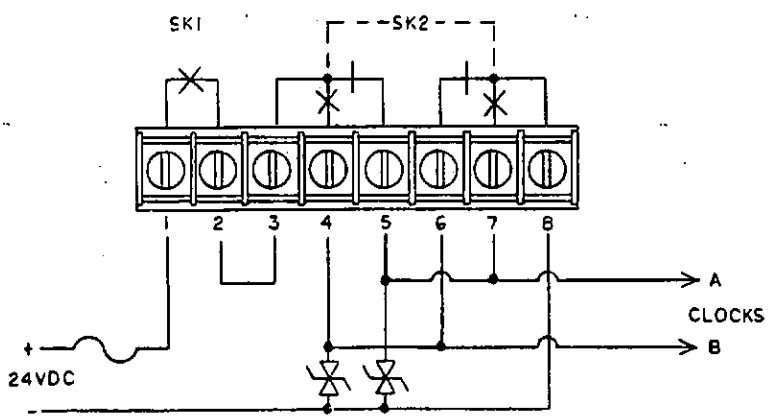
ENTER SECONDARY SELECTION CODE 12



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

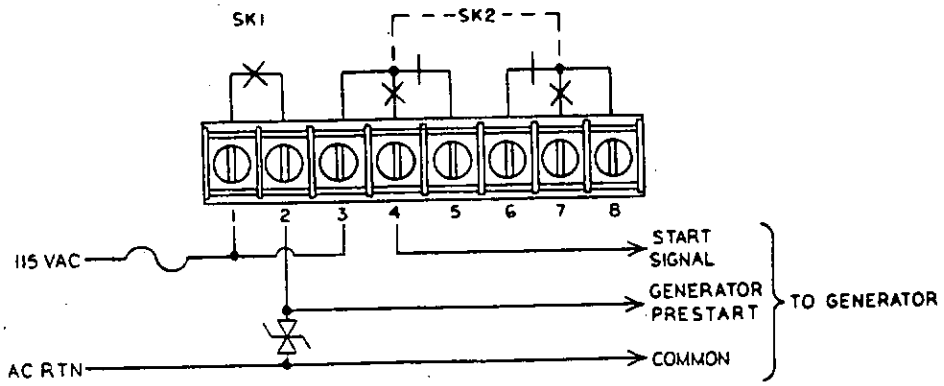


ELECTRONIC CODED CLOCKS

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 10th to the 13th 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 57th 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 5:57:08, 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 at 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 1		H:MM:20	H:MM:23		
Bell Circuit 2		H:MM:25	H:MM:28		
Bell Circuit 3		H:MM:30	H:MM:33		
Bell Circuit 4		H:MM:35	H:MM:38		
Bell Circuit 5		H:MM:40	H:MM:43		
Bell Circuit 6		H:MM:45	H:MM:48		

ENTER SECONDARY SELECTION CODE 14

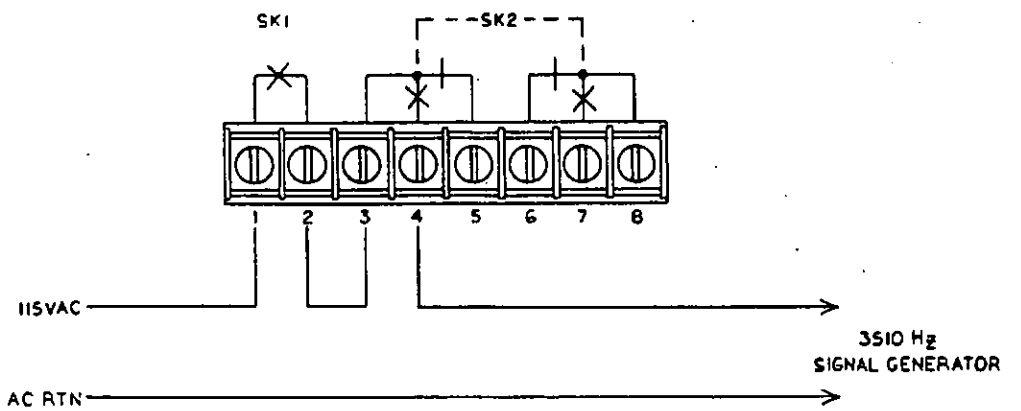


STRAIGHT FREQUENCY

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:

RELAY		FROM	TO
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)	H:57:54	H:58:02
	(12-Hour Correction)	5:57:54	5:58:08

ENTER SECONDARY SELECTION CODE 15



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

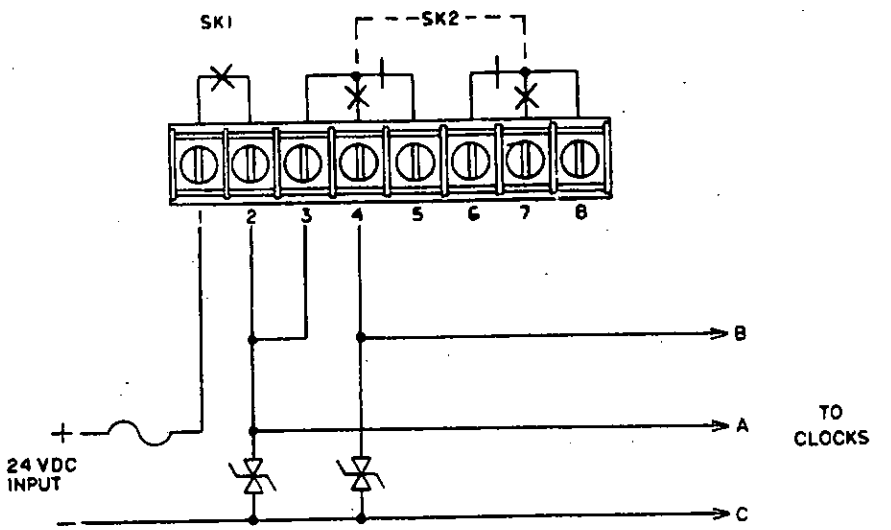
Each hour from the 59th minute through the 49th minute a two second pulse starting at the 58th second and ending at 00 seconds will be transmitted on both the A and B lines causing all clocks to advance each minute. From the 50th minute to the 59th minute, transmission will be on the A line only. Clocks which are less than ten minutes fast will stop at the 59th minute since they transfer to the B line at this time. Each hour starting at the 59th minute and 10 seconds a total of twenty rapid pulses occuring 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 6:44 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

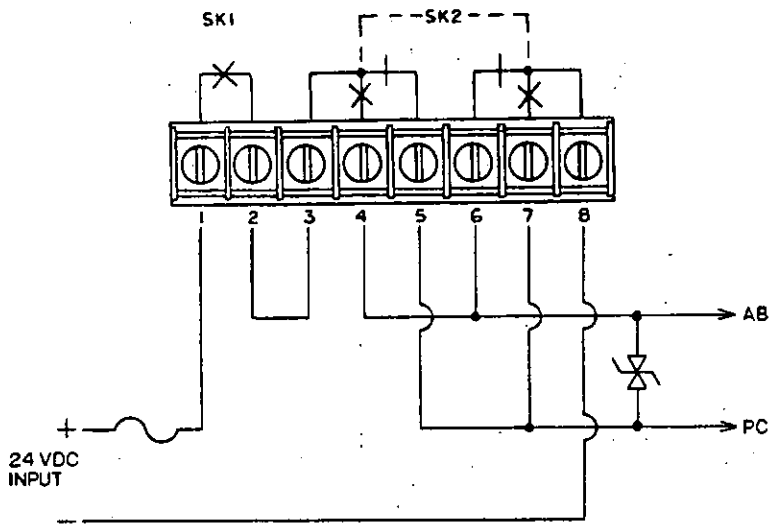


TWO WIRE REVERSE POLARITY MINUTE IMPULSE (59 MIN.) WITH 12 HOUR CORRECTION

Each hour from the 59th minute through the 49th minute a two second pulse starting at the 58th 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 50th minute to the 59th 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 59th 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 59th 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 6:44 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.

ENTER SECONDARY SELECTION CODE 16



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 proceding 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-8 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.

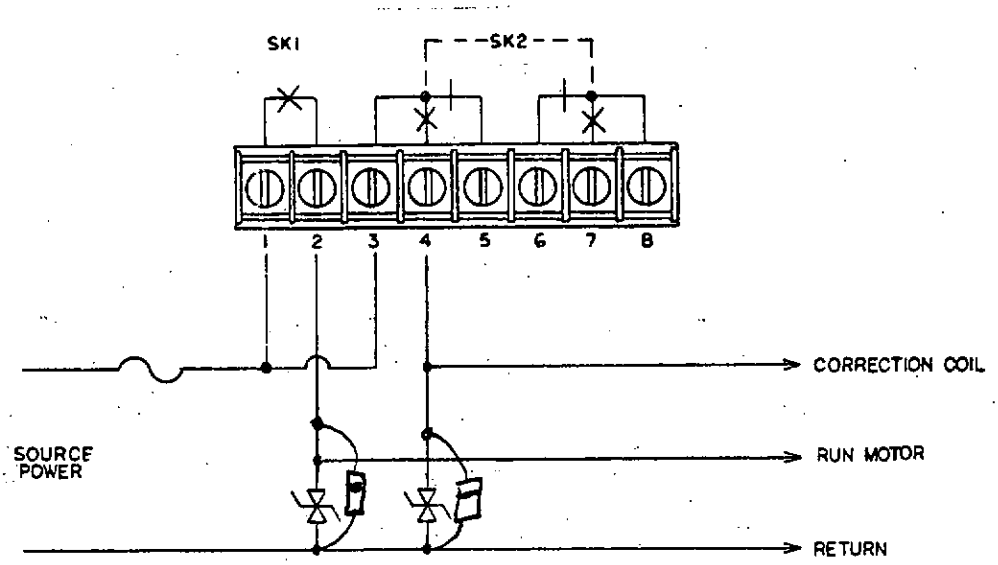
The allowable System Selection Codes for H-6 version EPROMS are as follows:

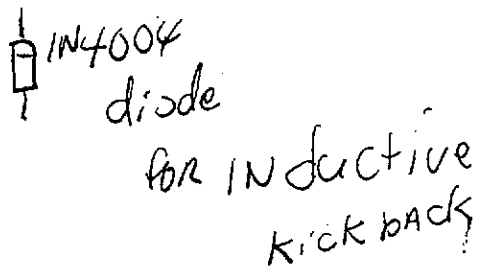
SELECTION CODE	TYPE SECONDARY	REFERENCE PAGE
18	National Synchronous Wired	c-1
19	Stromberg Synchronous Wired (56^{th} Min.)	c-2
20	Three Wire Minute Impulse (44^{th} Min.)	c-3
21	Cincinnati D-1	c-4
22	Dukane Synchronous Wired	c-5
23	Condor Digital Clocks (Model 2412)	c-6
24	Edwards Synchronous Wired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



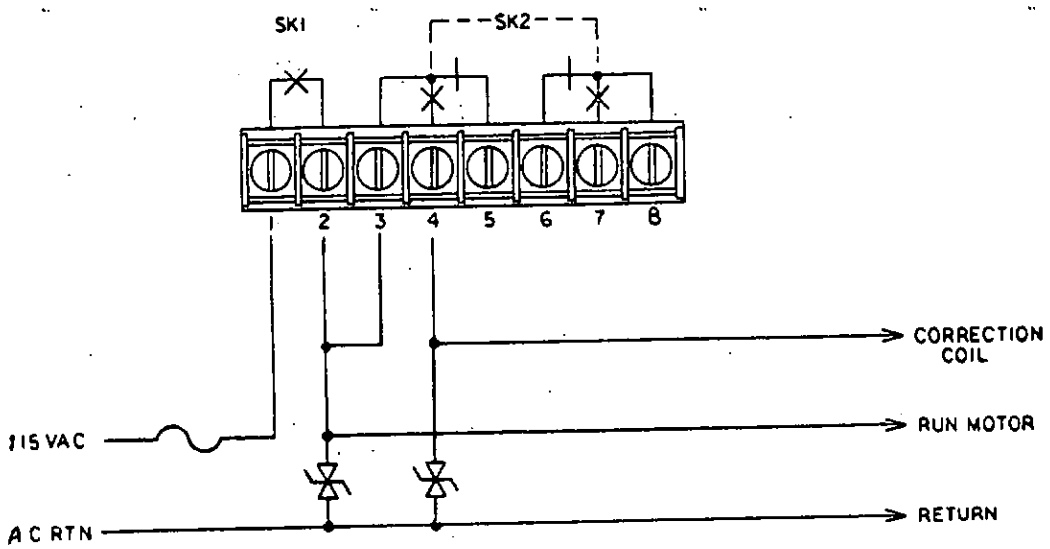


STROMBERG SYNCHRONOUS WIRED (56th MIN.)

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.

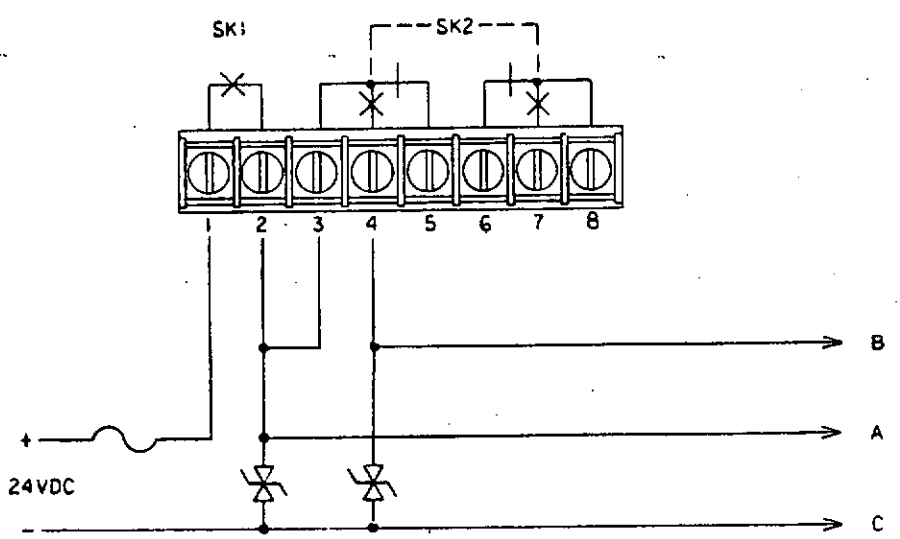


THREE WIRE MINUTE IMPULSE (44TH MIN.)

From the 58th second to 00 seconds each minute a 24vdc pulse is transmitted to the secondary clocks. From the 44th minute through the 34th minute the pulse is transmitted on both the A and B lines. From the 35th minute to the 44th minute the pulse is tramsmitted on the A line only. Clocks which are fast and reach the 44th minute ahead of the master will stop since, at this time, they will respond only to pulses transmitted on the B line. During the 44th minute from 10 seconds through the 50th 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

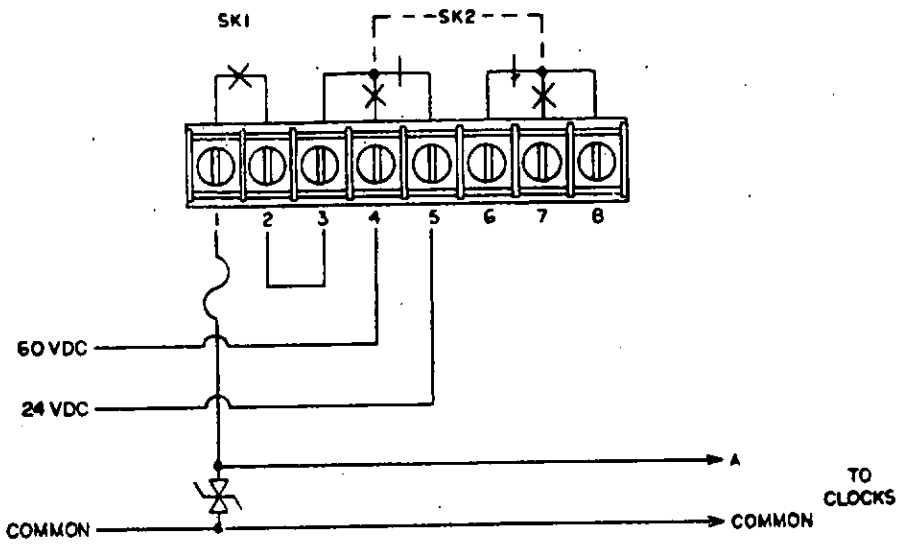


CINCINNATI D-1

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 04 through 58 only relay SK1 activates causing the output on Line A to be 24VDC. During minutes 59 through 03 relay SK2 is also activated, together with relay SK1, causing causing the output on line A to be 60VDC to advance all clocks. Clocks which are fast and reach the 59th 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.

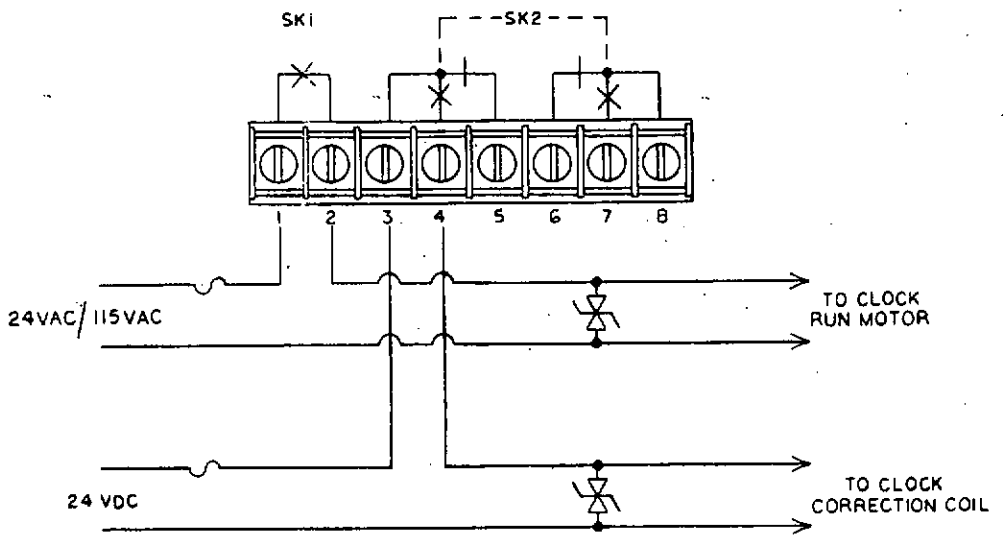
ENTER SECONDARY SELECTION CODE 21



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:57:59 relay SK2 energizes to furnish a 24VDC signal to the correction coil. This 59 second signal causes all secondaries to advance to the 58th minute thus synchronizing the seconds and minutes with the master. The 12 hour correction occurs twice daily beginning at 6:01:00. Every other minute from 6:01:00 through 6:19:50 relay SK2 energizes to furnish ten 50 second 24VDC signals to the clock correction coils (i.e. 6:01:00 to 6:01:50, 6:03:00 to 6:03:50, . . . , 6:19:00 to 6:19:50). These ten signals cause all secondaries, that are within 10 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 10 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)

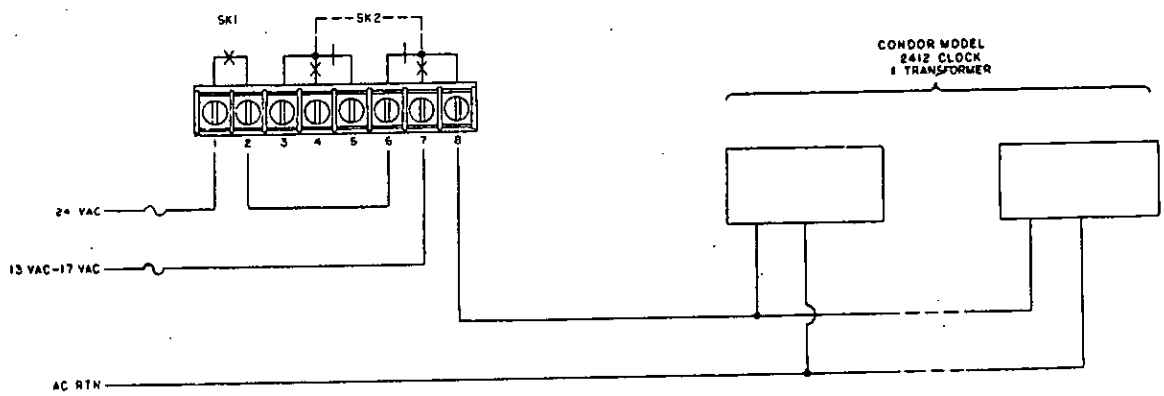
The Condor digital clocks initialize to 12:00AM when power is first applied. During normal operations the clocks maintain time by counting the 60 Hz AC line frequency. When the line voltage drops low, approximately two thirds normal level, the digital clocks will start rapidly advancing at a rate of 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 01 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).

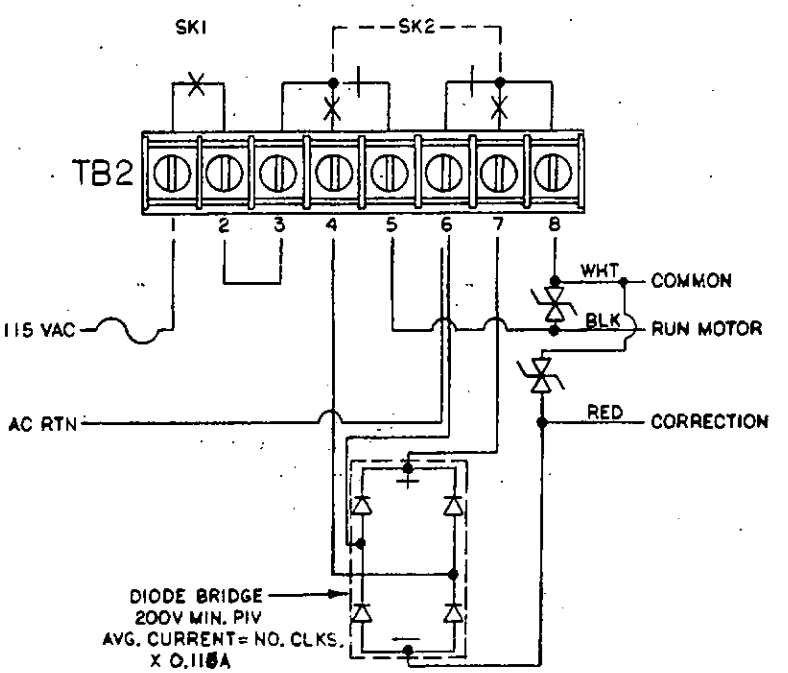
ENTER SECONDARY SELECTION CODE 23



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



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