Installation Manual V10.9

SBD Series 2-Wire and 3-Wire Clock

Current as of Feb. 2020

SBD Series 2-Wire and 3-Wire Clocks

Table of Contents

□ Available with 3200 and 3300 models

■ Available with 3300 model only

Important Safety Instructions

VERY IMPORTANT:

KNOW YOUR COMMUNICATION PROTOCOL

The SBD clock is designed to support the 2-Wire Digital Communication Protocol as well as 3-wire (sync-wire) communication protocols. To run either system properly, the clock requires the correct wiring format. It is very important that you only follow the wiring instructions appropriate to your clock's communication protocol. For example: if your system includes converter boxes which are only used for the 2-wire system, then you should only follow the instructions that relate to the 2-wire digital communication protocol wiring.

⚠ DANGER

⚡ SHOCK HAZARD

- Keep the electricity to this device turned OFF until the clock installation is complete.
- Do not expose the clock movement to water, or install the clock in a location where it may be exposed to water.

NOTICE

- Do not install the clock outdoors. Damage to the clock if placed outdoors voids the warranty.
- Do not hang objects from the clock or clock mounting parts. The clocks are not designed to support the weight of other objects.
- The clock face and housing may be cleaned with a damp cloth or disinfectant. Test other cleaning products on a small part of the clock housing before attempting to use on the rest of the clock. Avoid bleach and chemicals known to dissolve plastics.

⚠ WARNING

⚠ FIRE HAZARD

- Always follow your national and regional electrical codes or ordinances.
- The AC power circuit for the clock must be attached to a circuit breaker that can be reset by the user.

⚠ PHYSICAL INJURY HAZARD

- If you are standing on an object while installing your clock, make sure that the object can support your weight, and will not sway or move as you stand on it.
- Take precautions to avoid injury by potential safety hazards near the point of installation including (but not limited to) heavy machinery, sharp objects, hot surfaces, or exposed cables carrying an electric current.
- Follow all mounting instructions exactly as stated in this manual. Failure to do so may result in the device falling off the point of installation.
- Packaging materials and mounting items include plastic bags and small pieces, which pose a suffocation hazard to young children.

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Identify Your Clock

A label containing the part number of your clock is attached to the clock packaging

If your part number begins with SBD-31, you own a 3100 Series clock

If your part number begins with SBD-32, you own a 3200 clock

If your part number begins with SBD-33 you own a 3300 clock
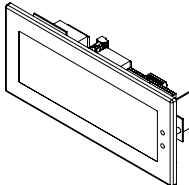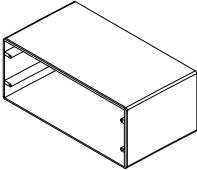
If the second group in your part number ends in S (31S, 32S, 33S), you own a Surface Mount Clock, which can be attached to a pole as a Flag Mount or a Double Mount.

If the second group in your part number ends in F (31F, 32F, 33F), you own a Flush Mount Clock, which can only be used in a flush mount configuration.
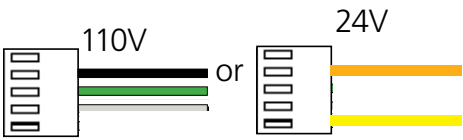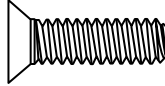
If you wish to change the mounting type, contact your dealer.

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Flush Mount Installation

Included in Package

Description	Quantity	Picture
SBD Digital Clock	1	
Digital Clock Wall Housing	1	

Included in Wiring Kit (D-PK-3-110-F or D-PK-3-24-F)

Description	Quantity	Picture
Power/grounding wires and connector	1	110V or 24V
Grounding wire	1	
Machine screw 6-32 x 1/2	4	
Hex nut 6-32	1	
Internal-tooth lock washer	1	

PLEASE NOTE: A user will also have to provide a Phillips-head screwdriver, a small flat-blade screwdriver, a single gang box, any equipment needed to install the gang box, and any additional wiring needed to extend the signal, power, or ground cables. You may also need a 1/4 inch drill if you decide not to attach the clock directly to the gang box.

If any of the items listed in the wiring kit are missing, you may contact your dealer and order a replacement kit.

Flush Mount Installation

1) Install the flush mount housing in the wall. Leave at least one inch between the top of the housing and ceiling. Confirm that the bottom of the housing is level with the floor.
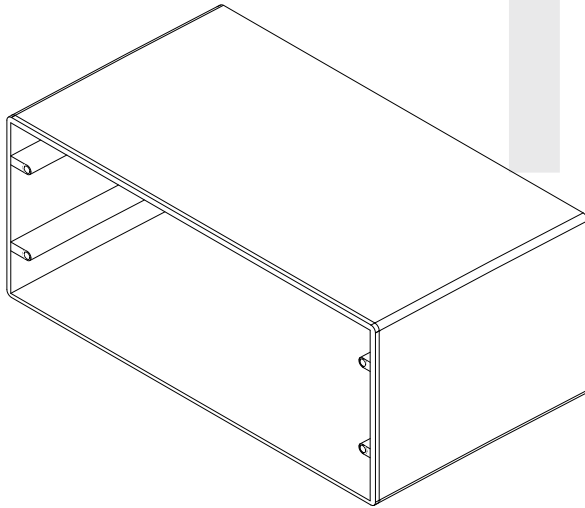
2) Run power and communication wiring to the flush mount housing. See the sections of this manual labeled "Wiring Information" for additional details, depending on your system.

CHECK YOUR WIRING

The voltage between the white and black wires should measure 105-126 volts AC in the 110 volt model, 207-253 volts AC in the 230 volt model, or Yellow & orange wires for 21.5-26.5 volts AC in the 24 volt model.

If you are using the 24 volt model, make sure that the wiring leading to the clock is from an ISOLATED transformer.

3) Attach the communication and power wires from your kit to the communication and power wires in the gang box. See the sections of this manual labeled "Communication Wiring Information"for additional details, depending on your system.
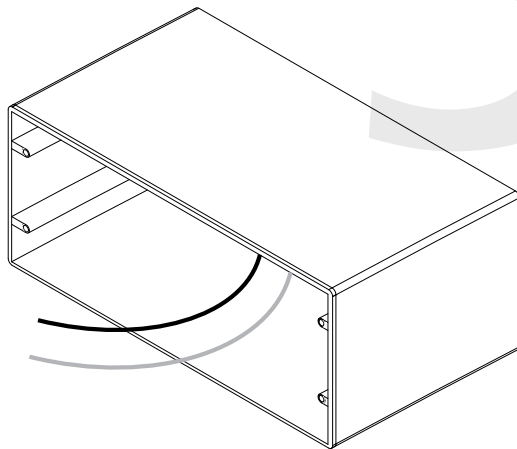
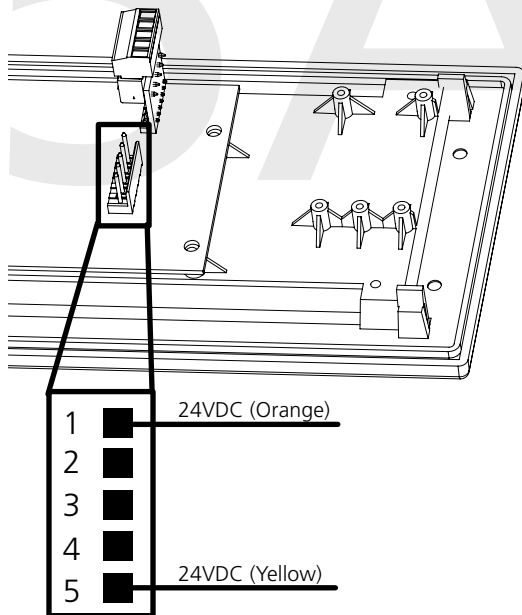4) Detach the filter from the clock display board by pressing inward on the red tabs.
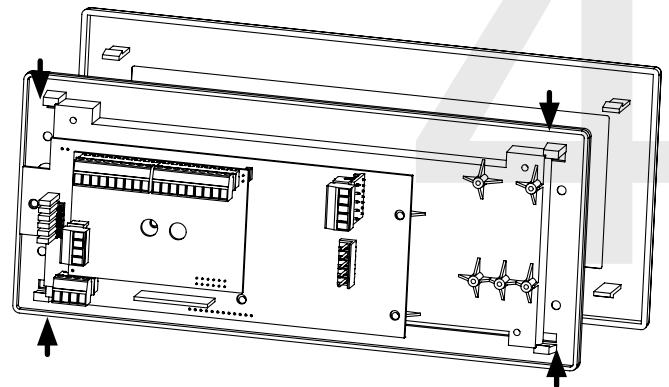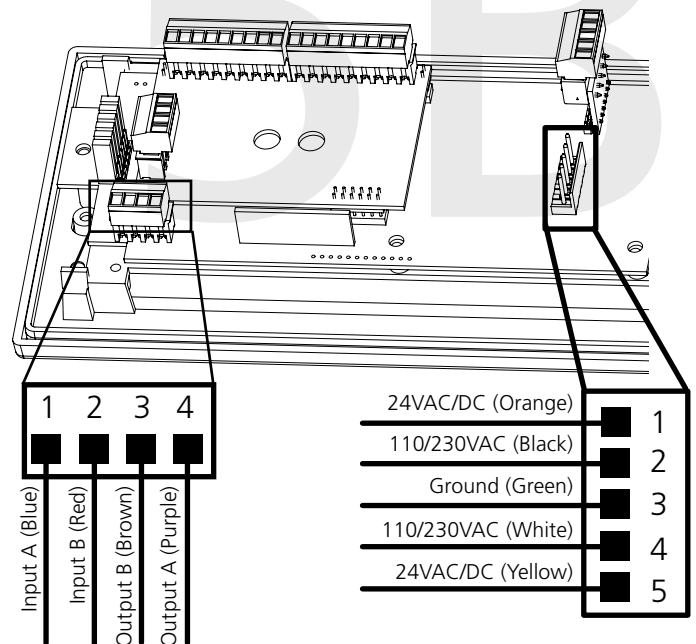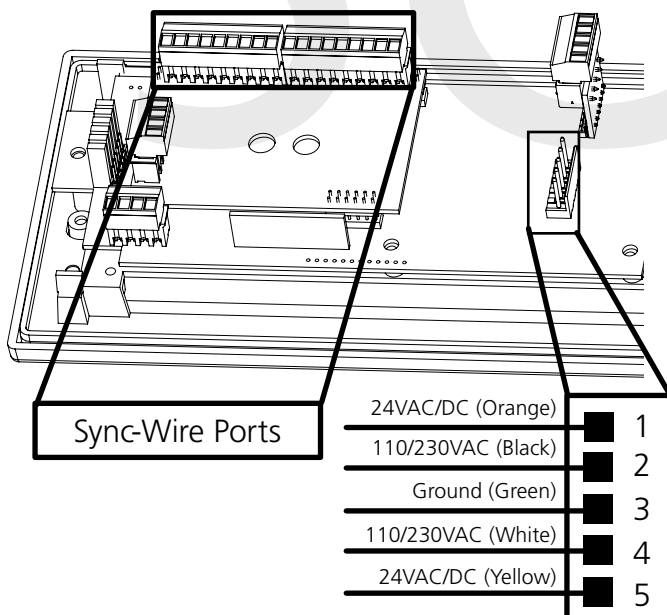
Flush Mount Installation

5A) If you are installing a 3100 series digital clock or a 3200/3300 digital clock that uses a 2-wire digital sync system, attach the wires to the port as shown below.

1 — 24VDC (Orange)
2
3
4
5 — 24VDC (Yellow)

5B) If you are installing a 3200 or 3300 series digital clock that uses an RS485 sync system, attach the wires to the port as shown below.

1 — Input A (Blue)
2 — Input B (Red)
3 — Output B (Brown)
4 — Output A (Purple)

24VAC/DC (Orange) — 1
110/230VAC (Black) — 2
Ground (Green) — 3
110/230VAC (White) — 4
24VAC/DC (Yellow) — 5

5C) If you are installing a 3300 series digital clock that uses a sync system other than 2-wire digital or RS485, attach the wires to the appropriate sync-wire ports. Refer to the section, "Inputs - Clock Side - Sync Wire" for instructions regarding each system.

Sync-Wire Ports

24VAC/DC (Orange) — 1
110/230VAC (Black) — 2
Ground (Green) — 3
110/230VAC (White) — 4
24VAC/DC (Yellow) — 5

6) Use the 6-32x1/2 screws to attach the display board to the housing.

NOTE: For 2.5" Digit clocks, the holes for the screws will be on the left and right inner surfaces of the housing. For 4.0" Digit Clocks, the holes will be on the top and bottom surfaces.

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Flush Mount Installation

7) Remove the plastic cover from the display board

8) Place the filter over the display board by lining up the tabs with the holes. You should hear a snapping noise as the latches drop into place
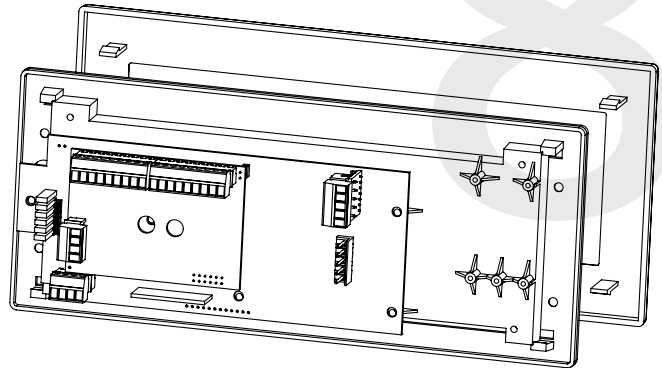
9) Power the clock. After testing the LED segments and presenting some diagnostic information, the clock will display the time based off if its internal quartz oscillator. It will correct itself to show synchronized time as soon as it receives data from a master clock.

Wall Mount Installation

Included in Package

Description	Quantity	Picture
SBD Digital Clock	1	
Digital Clock Wall Housing	1	
6-19x1/2 screw	4	
6-32x1 screw	4	

Included in Wiring Kit (D-PK-3-110-S or D-PK-3-24-S)

Description	Quantity	Picture
Power/grounding wires and connector	1	110V or 24V

PLEASE NOTE: A user will also have to provide a Phillips-head screwdriver, a small flat-blade screwdriver, a single gang box, any equipment needed to install the gang box, and any additional wiring needed to extend the signal, power, or ground cables. You may also need a 1/4 inch drill, 4 #8x1.5 self-tapping screws, and 4 wall anchors for those screws if you decide not to attach the clock directly to the gang box.

If any of the items listed in the wiring kit are missing, you may contact your dealer and order a replacement kit.

Wall Mount Installation

1) If you are installing a new gang box in the wall, leave at least 4 inches between the top of the gang box and ceiling. Confirm that the bottom of the gang box is level with the floor.

If you are using an existing gang box, the top of the gang box must be a minimum of three inches away from the ceiling.

Ceiling

4" Minimum

2) Run power and communication wiring to the gang box. See the sections of this manual labeled "Inputs - System Side" for additional details, depending on your system.

CHECK YOUR WIRING

The voltage between the white and black wires should measure 105-126 volts AC in the 110 volt model, 207-253 volts AC in the 230 volt model, or Yellow & orange wires for 21.5-26.5 volts AC in the 24 volt model.

If you are using the 24 volt model, make sure that the wiring leading to the clock is from an ISOLATED transformer.

3) Attach the communication and power wires from your kit to the communication and power wires in the gang box. See the sections of this manual labeled "Communication Wiring Information"for additional details, depending on your system.

4) If you do not wish to attach the housing to the gang box, proceed to step 5A. Otherwise, go to step 6.

Wall Mount Installation

5A) If you do not wish to attach the housing to a gang box, place the mounting piece on the wall. Leave at least 4 inches between the top rear edge of the housing and ceiling. Confirm that the bottom of the mounting piece is level with the floor.

Ceiling

4" Minimum
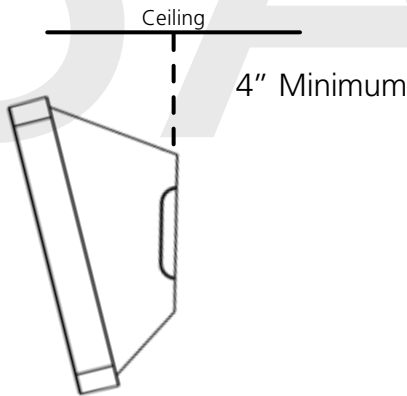
5B) Identify the keyholes towards the top of the back of the clock housing. Use a pencil to trace the top of each keyhole onto the wall, then use the 1/4 inch drill bit to drill holes at the locations of the two marks.
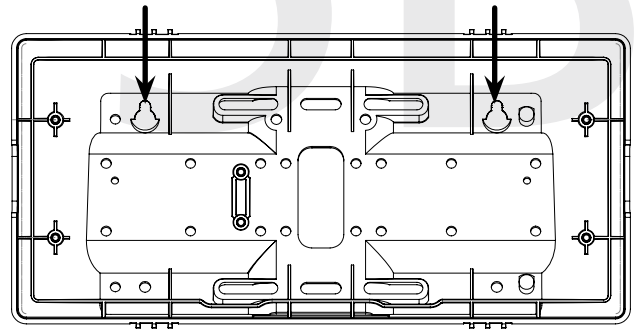
5C) Insert the wall anchors into the two holes, then place a #8 self-tapping screw into each wall anchor, leaving at least a 1/8" gap between the top of the screw and the wall.
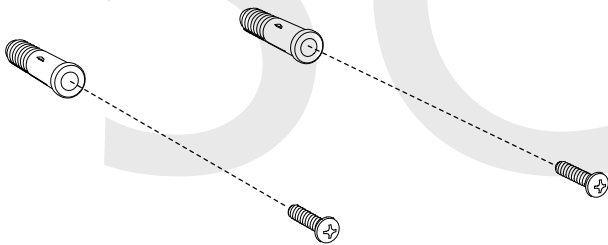
5D) Use the keyholes in the back of the housing to hang the clock onto the screws.
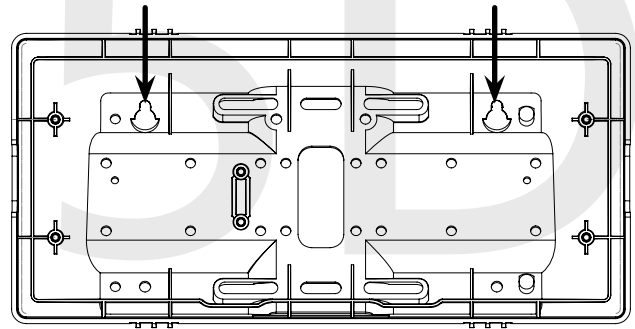
Wall Mount Installation

5E) Use a pencil to trace the holes beneath each keyhole onto the wall. Take the clock housing off the wall, drill holes at the marked locations, and add another two wall anchors.
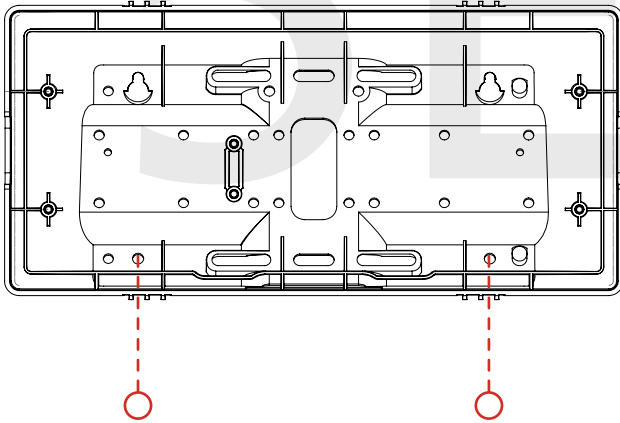
5F) Repeat step 5D, then pass another pair of #8 screws through the bottom holes and secure them in the remaining two wall anchors.
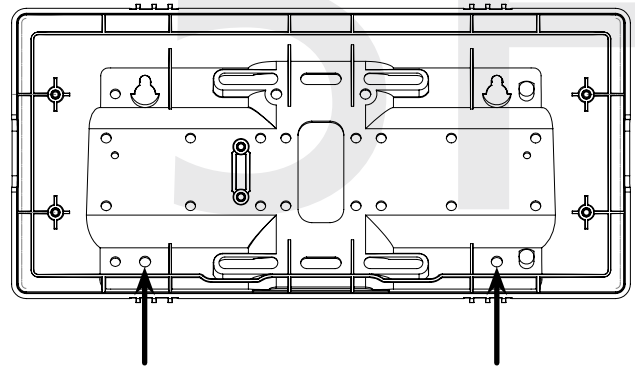
5G) Run power and signal wires through the large hole in the back of the housing. Secure the wires by passing them through the wire clamp.
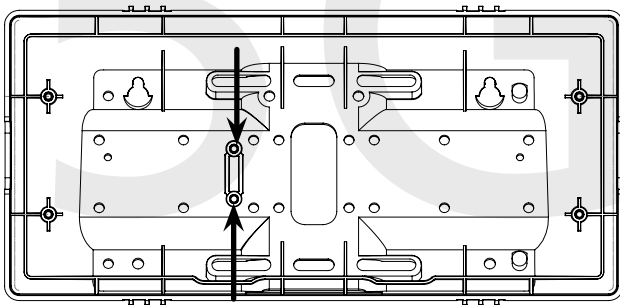
6) Perform step 5F, then attach the housing to the gang box using the #6-32x1 screws.

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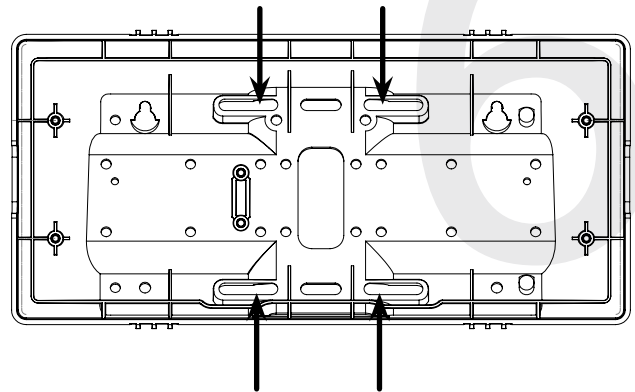
Wall Mount Installation

7) Detach the filter from the clock display board by pressing inward on the red tabs.
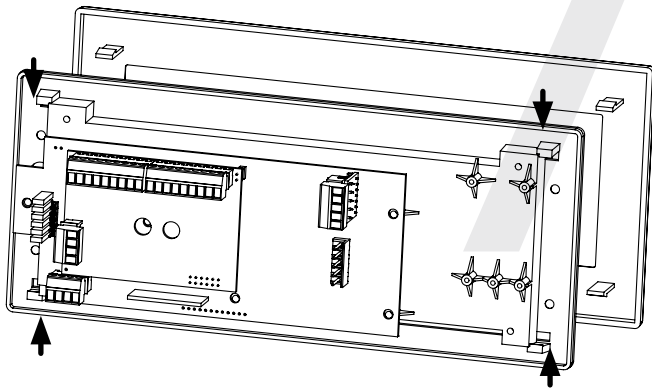
8A) If you are installing a 3100 series digital clock or a 3200/3300 digital clock that uses a 2-wire digital sync system, attach the wires to the port as shown below.

1	24VDC (Orange)
2	
3	
4	
5	24VDC (Yellow)
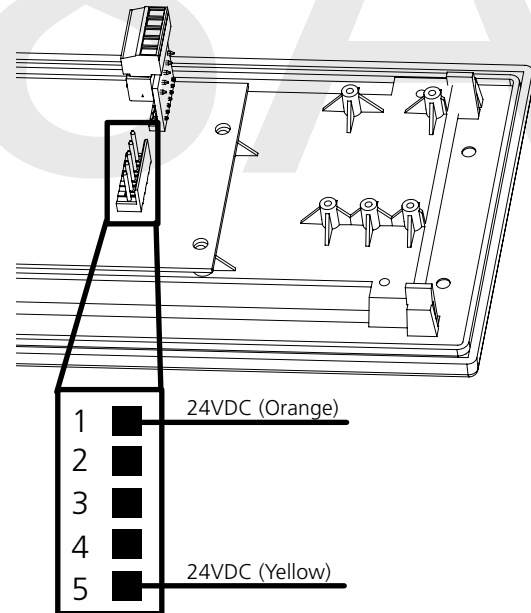
8B) If you are installing a 3200 or 3300 series digital clock that uses an RS485 sync system, attach the wires to the port as shown below.

8C) If you are installing a 3300 series digital clock that uses a sync system other than 2-wire digital or RS485, attach the wires to the appropriate sync-wire ports. Refer to the section, "Inputs - Clock Side - Sync Wire" for instructions regarding each system.

1	2	3	4
Input A (Blue)	Input B (Red)	Output B (Brown)	Output A (Purple)

24VAC/DC (Orange)	1
110/230VAC (Black)	2
Ground (Green)	3
110/230VAC (White)	4
24VAC/DC (Yellow)	5

Sync-Wire Ports

24VAC/DC (Orange)	1
110/230VAC (Black)	2
Ground (Green)	3
110/230VAC (White)	4
24VAC/DC (Yellow)	5

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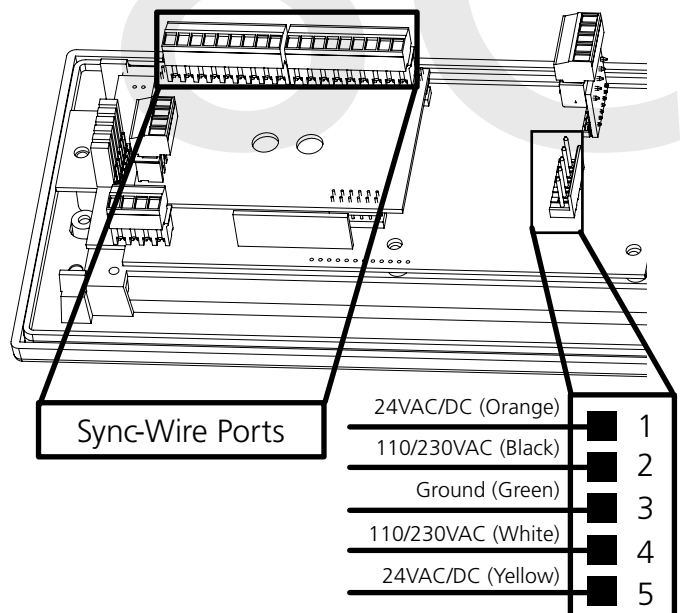
Wall Mount Installation

9) Detach the frame from the front of the clock housing by pulling the bottom and top edges away from the housing.
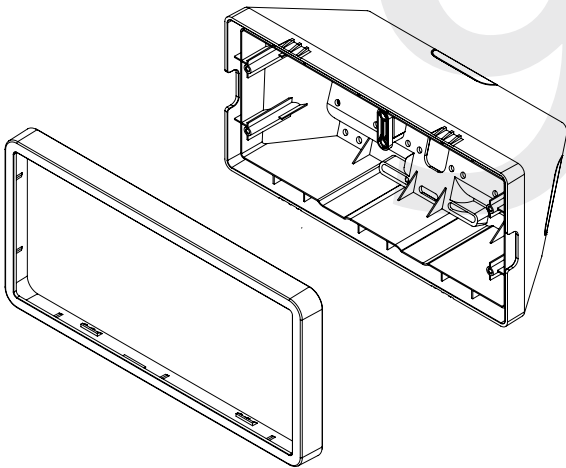
10) Use the 6-19x1/2 screws to attach the display board to the housing.

NOTE: For 2.5" Digit clocks, the holes for the screws will be on the left and right inner surfaces of the housing. For 4.0" Digit Clocks, the holes will be on the top and bottom surfaces.
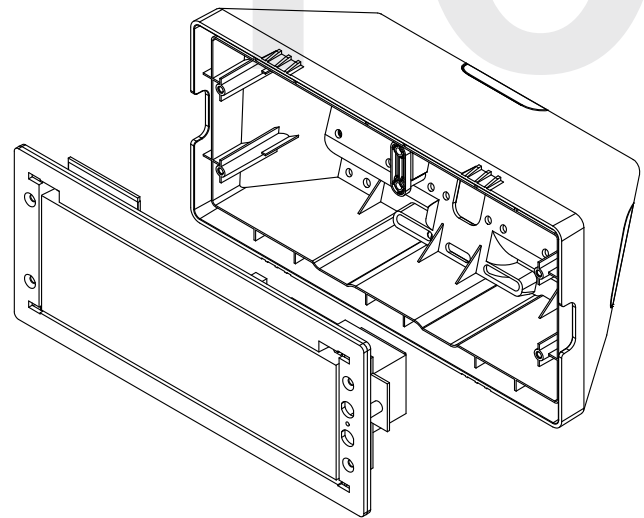
11) Remove the plastic cover from the display board.
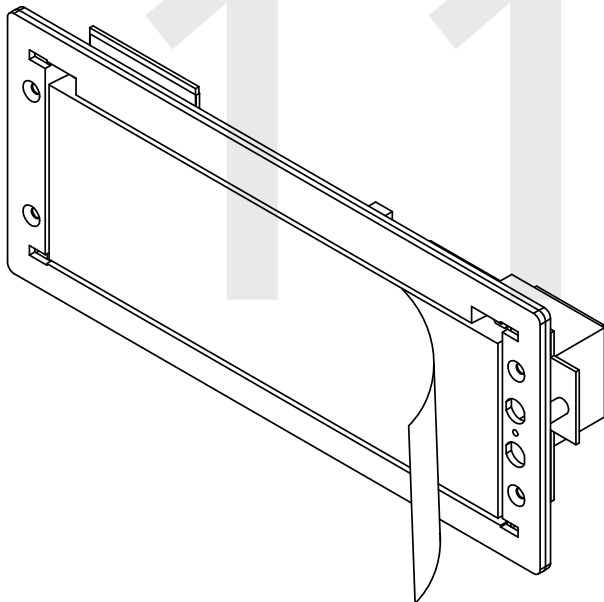
12) Place the filter over the display board. You should hear a snapping noise as the latches drop into place.
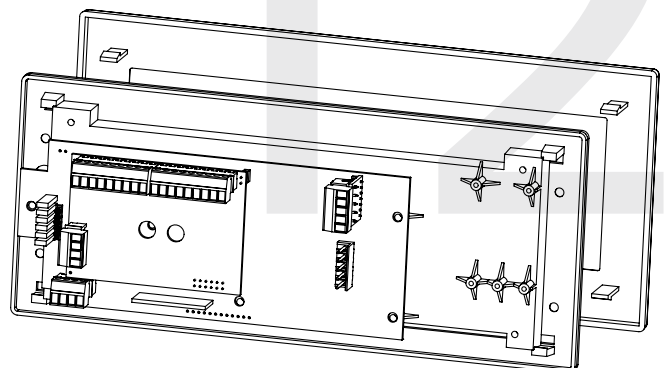
Wall Mount Installation
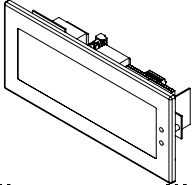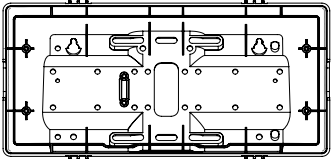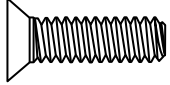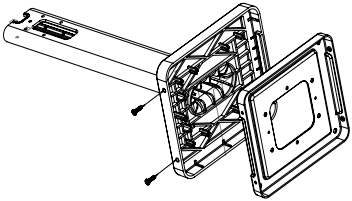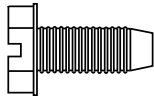
13) Place the housing frame onto the housing. You should hear a snapping noise as the latches drop into place.

14) Power the clock. After testing the LED segments and presenting some diagnostic information, the clock will display the time based off if its internal quartz oscillator. It will correct itself to show synchronized time as soon as it receives data from a master clock.

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Flag Mount Installation

Included in Package

Description	Quantity	Picture
SBD Digital Clock	1	
Digital Clock Wall Housing	1	
6-19x1/2 screw	4	
6-32x1 screw	4	

Included in Pole Kit (SAB-4GD-00S-0 or SAB-1GD-00S-0)

Dual-mount pole, including mounting plate	1	
#10-32x3/8 green screw	1	
#8-32x7/16 screw	8	
M3.5-1.0x10 screw (black)	4	
Internal-tooth washer	8	

If any of the items listed in the kits are missing, you may contact your dealer and order a replacement kit.

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Flag Mount Installation

#6-32x1 screw	4	

Adapter tab screws	4	

Included in Wiring Kit (D-PK-3-110-S or D-PK-3-24-S) - 2 kits included

Power/grounding wires and connector	1	110V or 24V

PLEASE NOTE: A user will also have to provide a Phillips-head screwdriver, a small flat-blade screwdriver, a single gang box, any equipment needed to install the gang box, and any additional wiring needed to extend the signal, power, or ground cables. You may also need a 1/4 inch drill, 4 #8x1.5 self-tapping screws, and 4 wall anchors for those screws if you decide not to attach the clock directly to the gang box.

If any of the items listed in the wiring kit are missing, you may contact your dealer and order a replacement kit.

Flag Mount Installation

1) Install the double gang box in the wall or ceiling. If you are installing the gang box in the wall, leave at least eleven inches between the top of the gang box and the ceiling. If you are installing the gang box in the ceiling, leave at least eleven inches between the gang box and the wall. The box should be installed level and plumb with the wall and ceiling.

Ceiling - - - - -

11" Minimum

2) Run power and communication wiring to the gang box. See the sections of this manual labeled "Inputs - System Side" for additional details, depending on your system.

CHECK YOUR WIRING

The voltage between the white and black wires should measure 105-126 volts AC in the 110 volt model, 207-253 volts AC in the 230 volt model, or Yellow & orange wires for 21.5-26.5 volts AC in the 24 volt model.

If you are using the 24 volt model, make sure that the wiring leading to the clock is from an ISOLATED transformer.

3) Detach the mounting plate from the mounting pole by unscrewing the two screws. Set the screws and pole aside for later.

4) Attach the mounting plate to the gang box using only two of the four long, silver #6-32x1 screws. With the mounting plate as a guide, use the pencil to trace the locations of the four larger holes at the outer corners.

Flag Mount Installation

Steps 5 and 6 only apply to metal mounting poles. If you have an ABS mounting pole, skip to step 7

5) Remove the mounting pole end cap and the plastic ring from one of the holes.
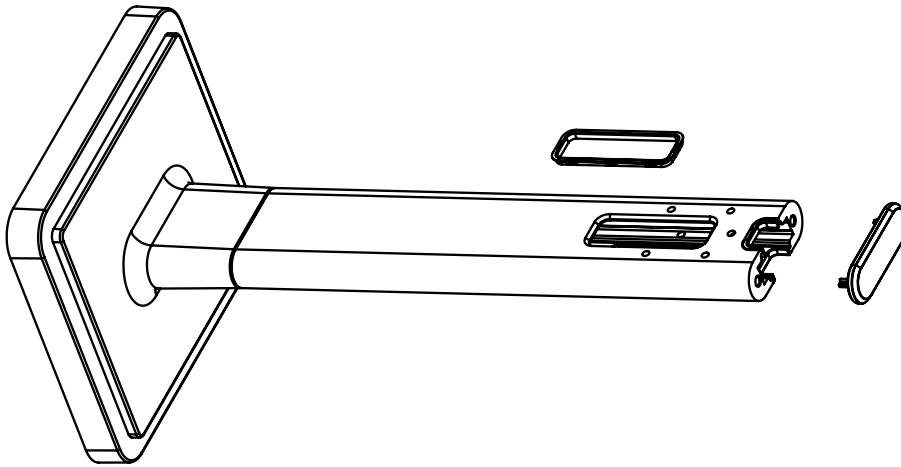
6) Attach the flag-mount end cap to the pole. Confirm that the covering flap is attached to the side where the plastic ring was removed.
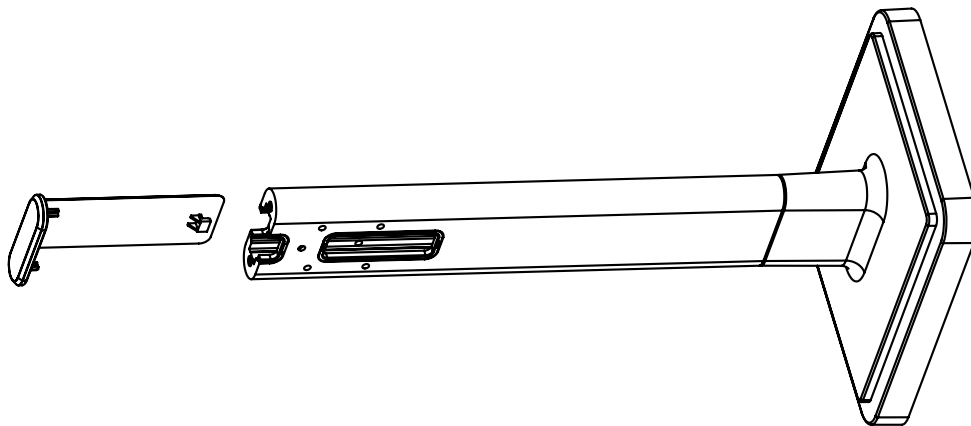
Flag Mount Installation

7) Remove the mounting plate and drill the four holes that were just traced. Insert the four wall anchors into the holes.
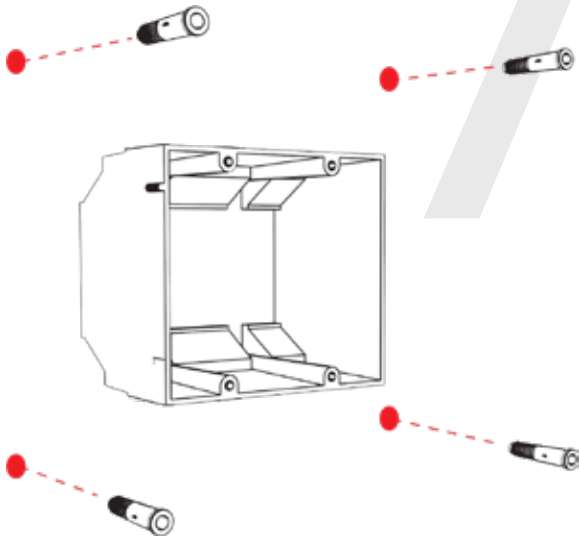
8) Reattach the mounting plate, this time using all four long, silver #6-32x1 screws, then insert the four #8 screws through the mounting plate and into the anchors.
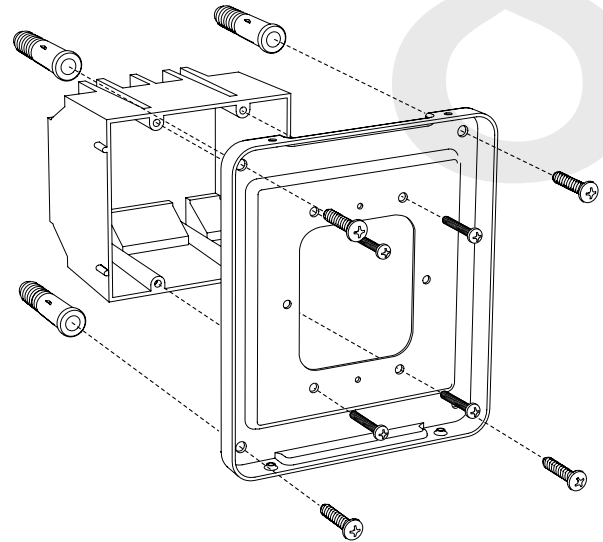
9) Thread any wiring through the mounting plate, and attach a grounding wire to the mounting plate using one of the larger centered holes and the #10-32x3/8 screw.
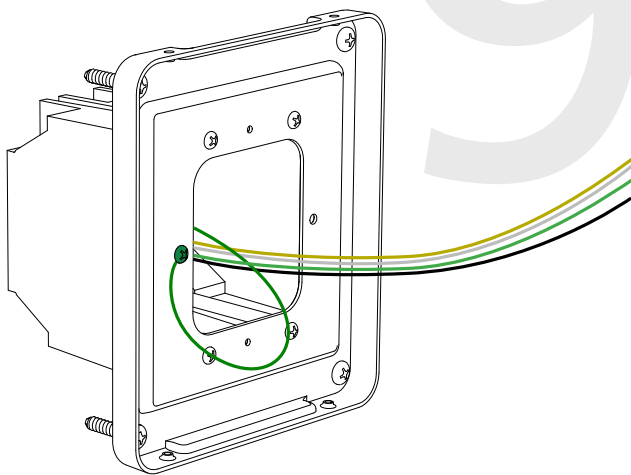
10) Use a screwdriver to remove one of the end caps. The selected end cap should match the position of the orientation of the clock on the mounting pole; for example, if you wish to attach the clock to the pole in a ceiling-mount configuration, then the top end cap should be removed. The end cap and screw that was used to secure it will not be needed again during this installation.

Flag Mount Installation

11) Detach the frame from the front of the clock housing by pulling the bottom and top edges away from the housing.
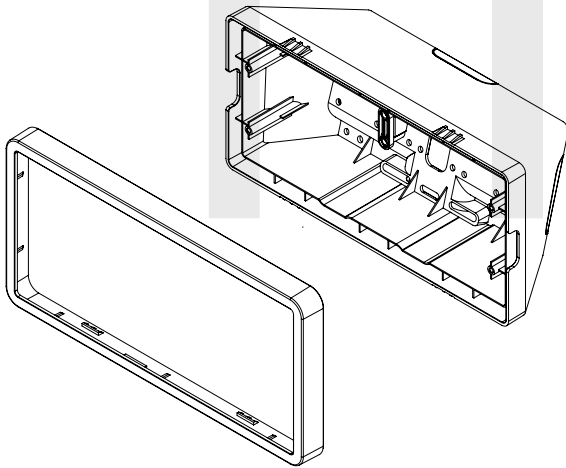
12) Insert the four #8-32x7/16 screws through the internal-tooth washers, then through the adapter, and finally into the pole. Use a screwdriver to tighten the screws so that the adapter does not move.
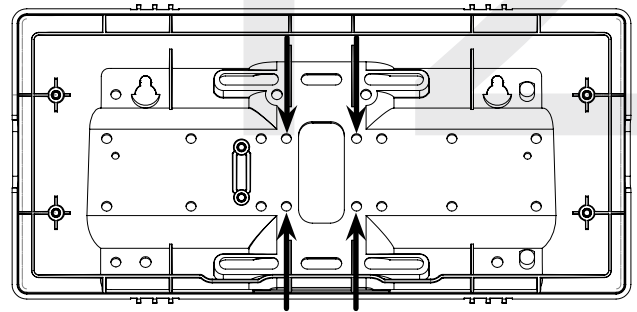
13) Thread at least fifteen inches (38.1cm) of wiring from the gang box through the bottom of the pole until each wire exits through the hole in the adapter.

Wire Clamp   Adapter hole
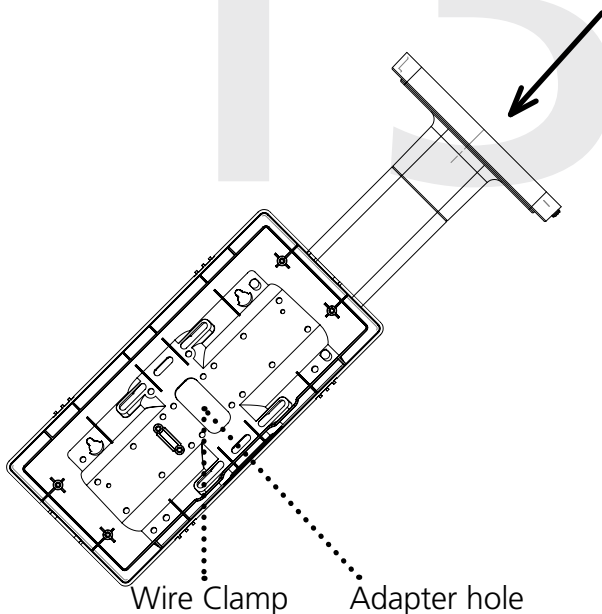
14) Detach the filter from the clock display board by pressing inward on the red tabs.
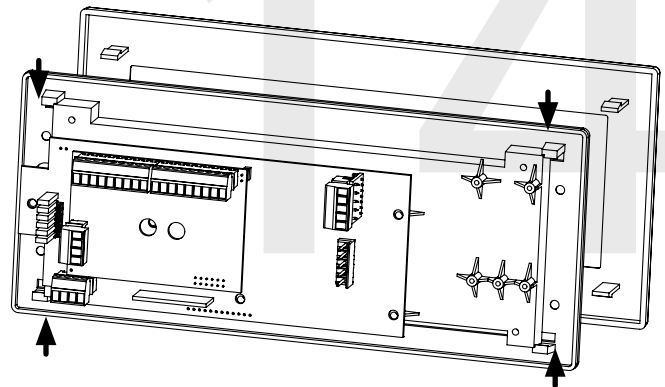
Flag Mount Installation

15A) If you are installing a 3100 series digital clock or a 3200/3300 digital clock that uses a 2-wire digital sync system, attach the wires to the port as shown below.

1 24VDC (Orange)
2
3
4
5 24VDC (Yellow)

15B) If you are installing a 3200 or 3300 series digital clock that uses an RS485 sync system, attach the wires to the port as shown below.

1 2 3 4

Input A (Blue)
Input B (Red)
Output B (Brown)
Output A (Purple)

24VAC/DC (Orange) 1
110/230VAC (Black) 2
Ground (Green) 3
110/230VAC (White) 4
24VAC/DC (Yellow) 5

15C) If you are installing a 3300 series digital clock that uses a sync system other than 2-wire digital or RS485, attach the wires to the appropriate sync-wire ports. Refer to the section, "Inputs - Clock Side - Sync Wire" for instructions regarding each system.

Sync-Wire Ports

24VAC/DC (Orange) 1
110/230VAC (Black) 2
Ground (Green) 3
110/230VAC (White) 4
24VAC/DC (Yellow) 5

16) Use the M3/5-15x12 screws to attach the display board to the housing.

NOTE: For 2.5" Digit clocks, the holes for the screws will be on the left and right inner surfaces of the housing. For 4.0" Digit Clocks, the holes will be on the top and bottom surfaces.

Flag Mount Installation

17) Use the 6-32x12 screws to attach the display board to the housing.

NOTE: For 2.5" Digit clocks, the holes for the screws will be on the left and right inner surfaces of the housing. For 4.0" Digit Clocks, the holes will be on the top and bottom surfaces.
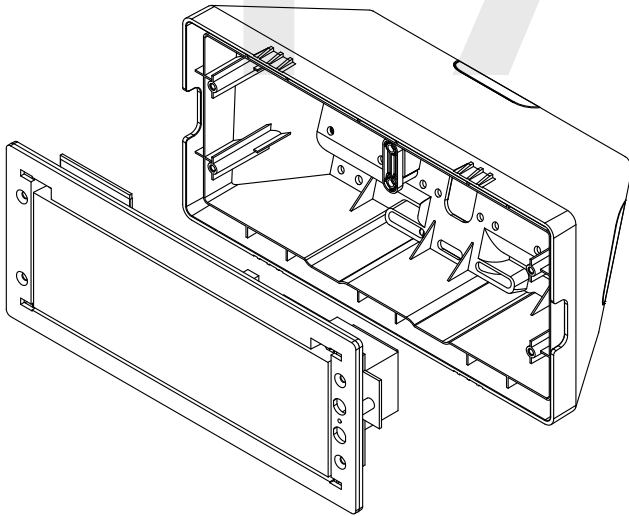
18) Remove the plastic cover from the display board.
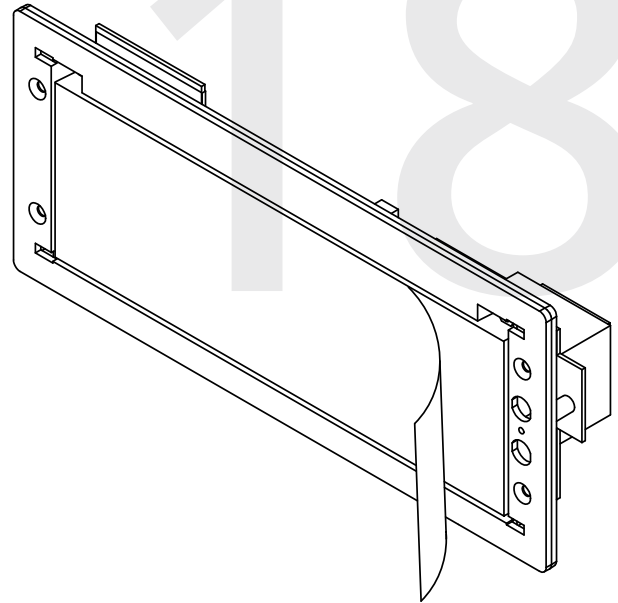
19) Place the filter over the display board. You should hear a snapping noise as the latches drop into place.
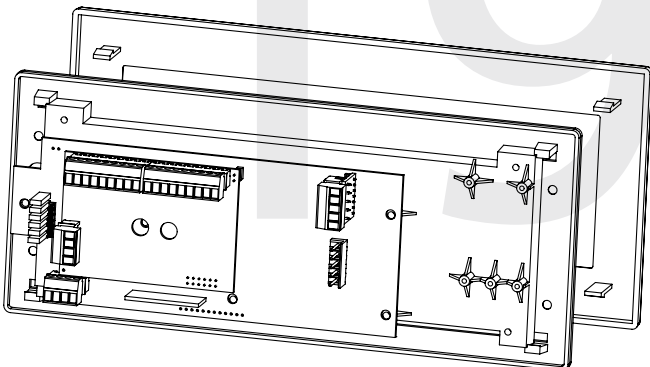
20) Place the housing frame onto the housing. You should hear a snapping noise as the latches drop into place.
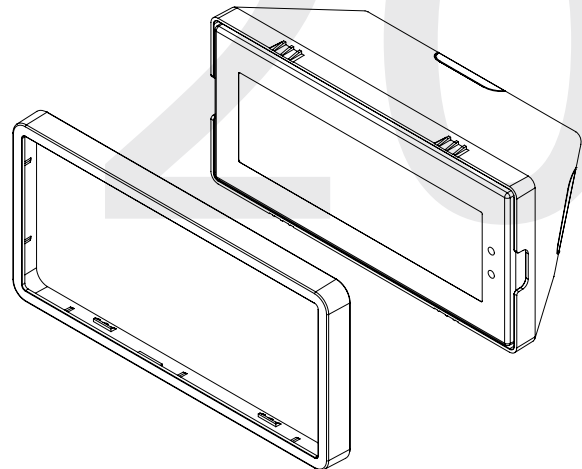
Flag Mount Installation
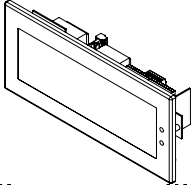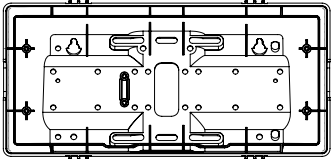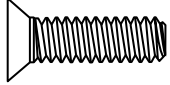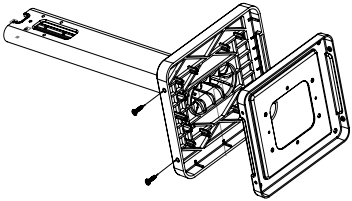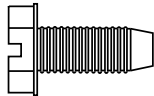
21) Hang the base of the pole on the mounting plate so that the lip is on top of the base, and the holes for the screws are on the bottom of the base. Attach the wires from the pole to the wires in the gang box, then use the two black base screws to attach the other side of the base to the mounting plate.

WALL

CEILING
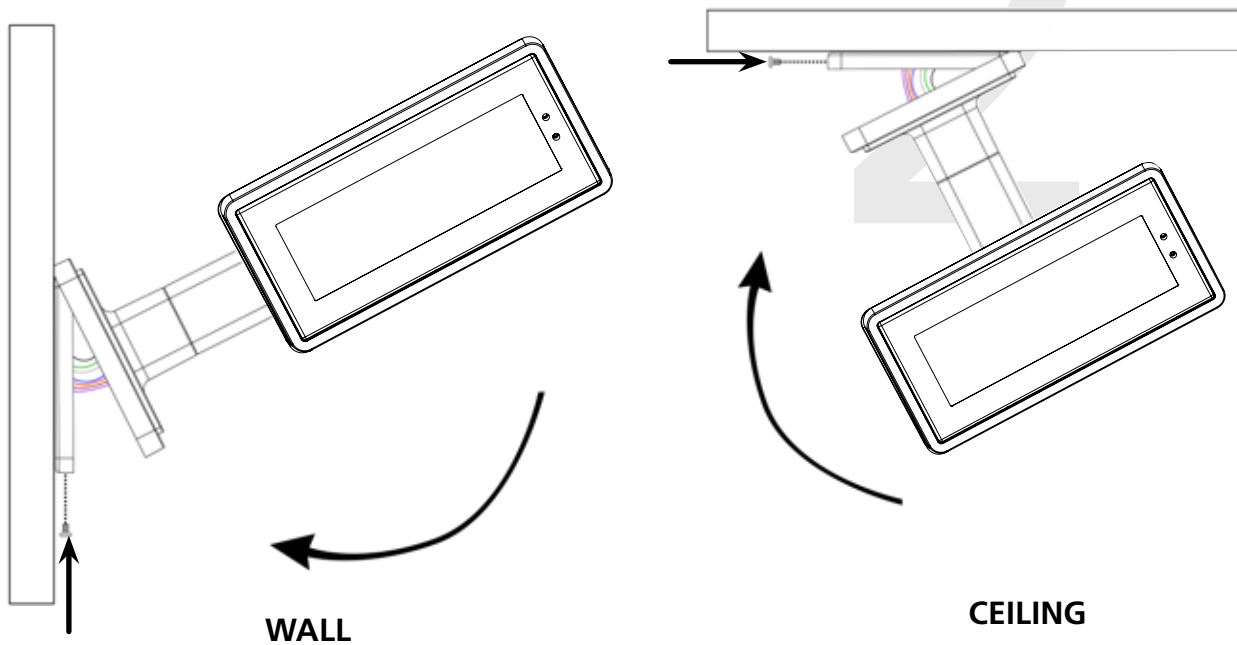
22) Power the clock. After testing the LED segments and presenting some diagnostic information, the clock will display the time based off if its internal quartz oscillator. It will correct itself to show synchronized time as soon as it receives data from a master clock.

Double Mount Installation

Included in Package

Description	Quantity	Picture
SBD Digital Clock	1	
Digital Clock Wall Housing	1	
6-19x1/2 screw	8	
6-32x1 screw	8	

Included in Pole Kit (SAB-4GD-00S-0 or SAB-1GD-00S-0)

Description	Quantity	Picture
Dual-mount pole, including mounting plate	1	
#10-32x3/8 green screw	1	
#8-32x7/16 screw	8	
M3.5-1.0x10 screw (black)	4	
Internal-tooth washer	8	

If any of the items listed in the kits are missing, you may contact your dealer and order a replacement kit.

Double Mount Installation

#6-32x1 screw	4	
Adapter tab screws	4	

Included in Wiring Kit (D-PK-3-110-S or D-PK-3-24-S) - 2 kits included

Power/grounding wires and connector	1	110V or 24V

PLEASE NOTE: A user will also have to provide a Phillips-head screwdriver, a small flat-blade screwdriver, a single gang box, any equipment needed to install the gang box, and any additional wiring needed to extend the signal, power, or ground cables. You may also need a 1/4 inch drill, 4 #8x1.5 self-tapping screws, and 4 wall anchors for those screws if you decide not to attach the clock directly to the gang box.

If any of the items listed in the wiring kit are missing, you may contact your dealer and order a replacement kit.

Double Mount Installation

1) Install the double gang box in the wall or ceiling. If you are installing the gang box in the wall, leave at least eleven inches between the top of the gang box and the ceiling. If you are installing the gang box in the ceiling, leave at least eleven inches between the gang box and the wall. The box should be installed level and plumb with the wall and ceiling.

Ceiling - - - - -

11" Minimum

2) Run power and communication wiring to the gang box. See the sections of this manual labeled "Inputs - System Side" for additional details, depending on your system.

CHECK YOUR WIRING

The voltage between the white and black wires should measure 105-126 volts AC in the 110 volt model, 207-253 volts AC in the 230 volt model, or Yellow & orange wires for 21.5-26.5 volts AC in the 24 volt model.

If you are using the 24 volt model, make sure that the wiring leading to the clock is from an ISOLATED transformer.

3) Detach the mounting plate from the mounting pole by unscrewing the two screws. Set the screws and pole aside for later.

4) Attach the mounting plate to the gang box using only two of the four long, silver #6-32x1 screws. With the mounting plate as a guide, use the pencil to trace the locations of the four larger holes at the outer corners.

27

Double Mount Installation

5) Remove the mounting plate and drill the four holes that were just traced. Insert the four wall anchors into the holes.
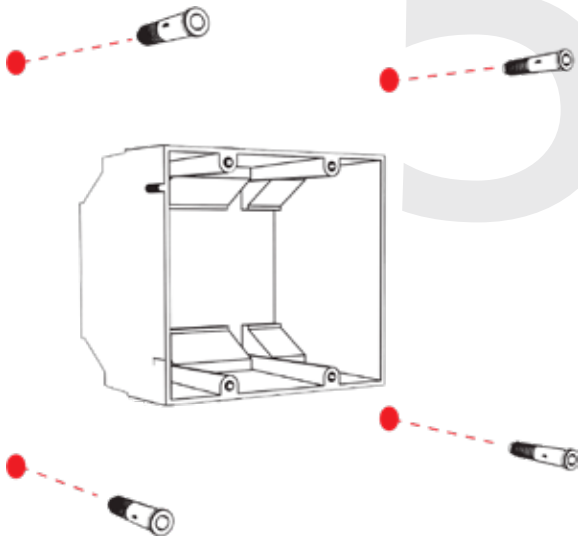
6) Reattach the mounting plate, this time using all four long, silver #6-32x1 screws, then insert the four #8 screws through the mounting plate and into the anchors.
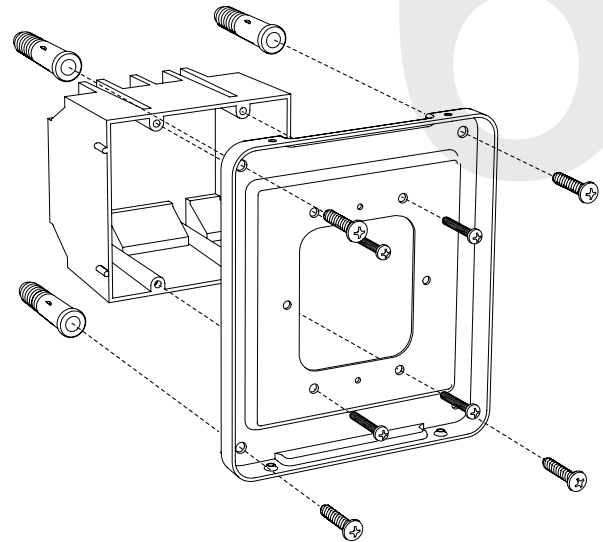
7) Thread any wiring through the mounting plate, and attach a grounding wire to the mounting plate using one of the larger centered holes and the #10-32x3/8 screw.
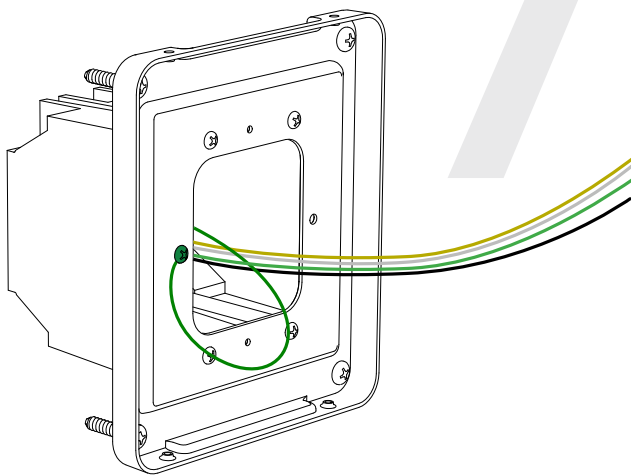
8) Use a screwdriver to remove one of the end caps. The selected end cap should match the position of the orientation of the clock on the mounting pole; for example, if you wish to attach the clock to the pole in a ceiling-mount configuration, then the top end cap should be removed. The end cap and screw that was used to secure it will not be needed again during this installation.

Double Mount Installation

9) Detach the frame from the front of each clock housing by pulling the bottom and top edges away from the housing.
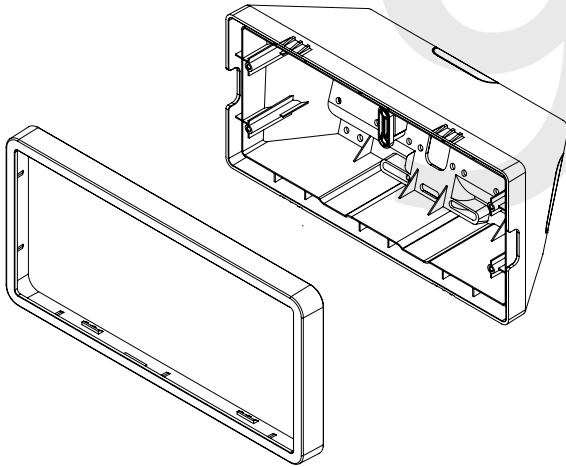
10) Insert the four #8-32x7/16 screws through the internal-tooth washers, then through each adapter, and finally into the pole. Use a screwdriver to tighten the screws so that the adapters do not move.
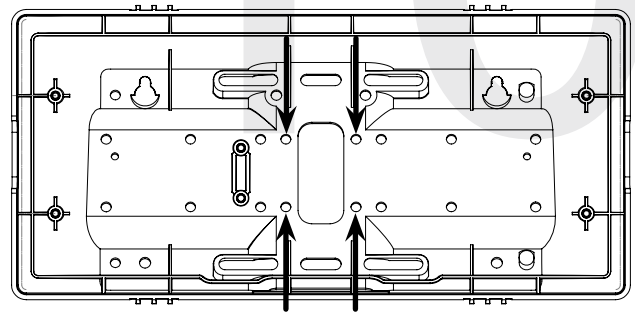
11) Attach adapters to each other using adapter tab screws, two on each side.
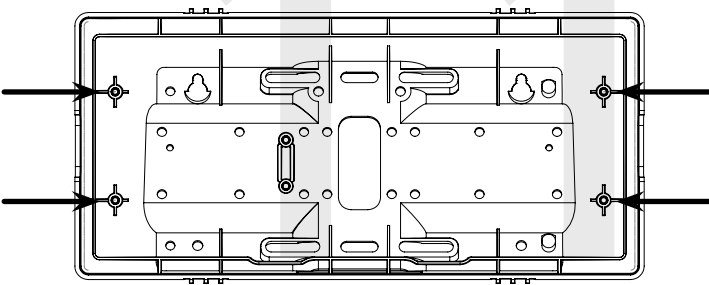
12) Thread at least fifteen inches (38.1cm) of wiring from the gang box through the bottom of the pole until each wire exits through the hole in each adapter. Secure the wires by passing them through the wire clamp.
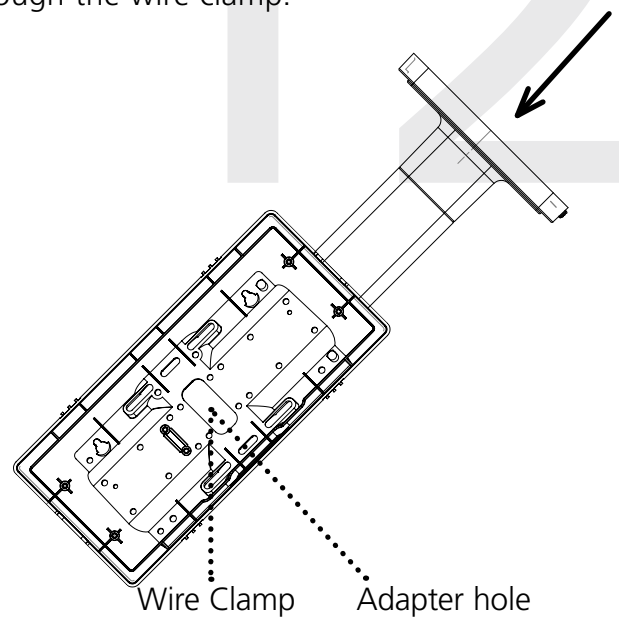
Wire Clamp   Adapter hole

13) Detach the filter from the clock display board by pressing inward on the red tabs.

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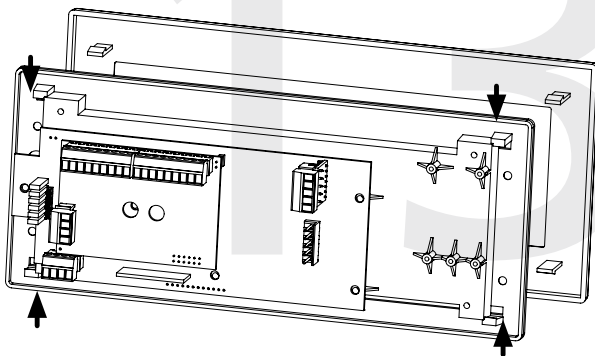
Double Mount Installation

13) Attach the signal and power wires from your kit to the wires you threaded through the poles. Consult the diagrams below for additional help, or see the sections of this manual labeled "3-Wire Synchronous (Sync-Wire) Communication Wiring Information", "2-Wire Digital Communication Wiring Information", or "RS485 Wiring Information" for additional details, depending on your system.

Please refer to the wiring guide

3-Wire Sync

2-Wire Digital

RS485

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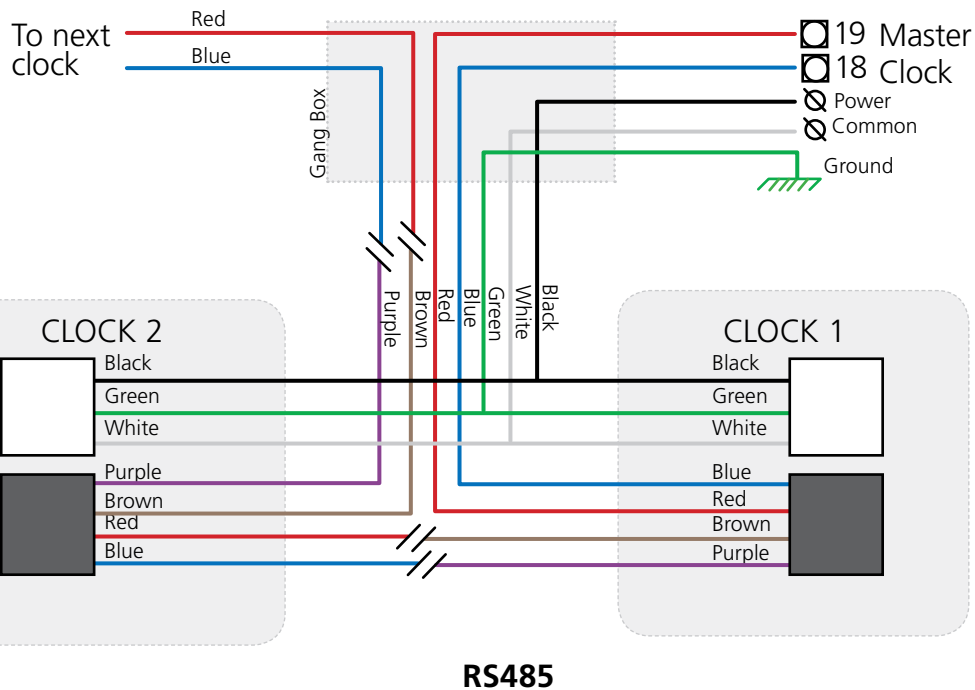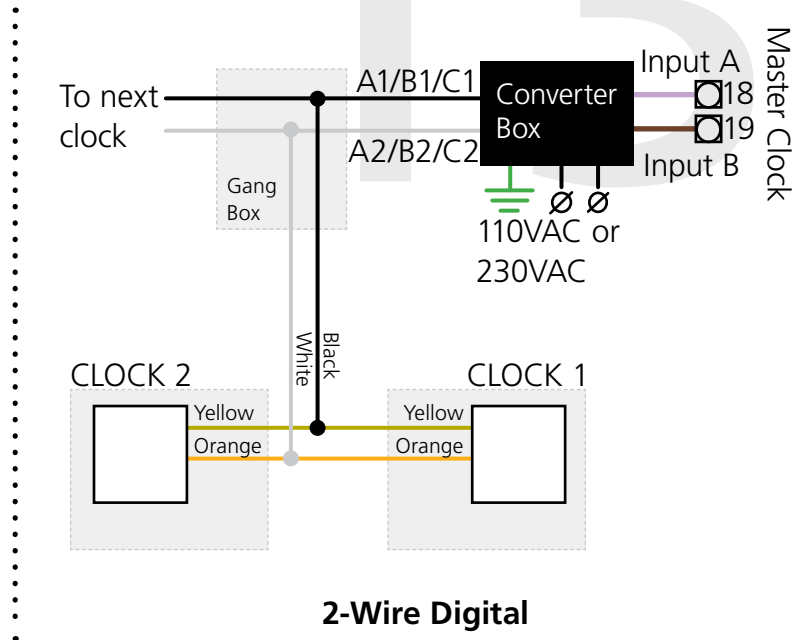
Double Mount Installation

14A) If you are installing 3100 series digital clocks or 3200/3300 digital clocks that use a 2-wire digital sync system, attach the wires to the port as shown below.

1 24VDC (Orange)
2
3
4
5 24VDC (Yellow)
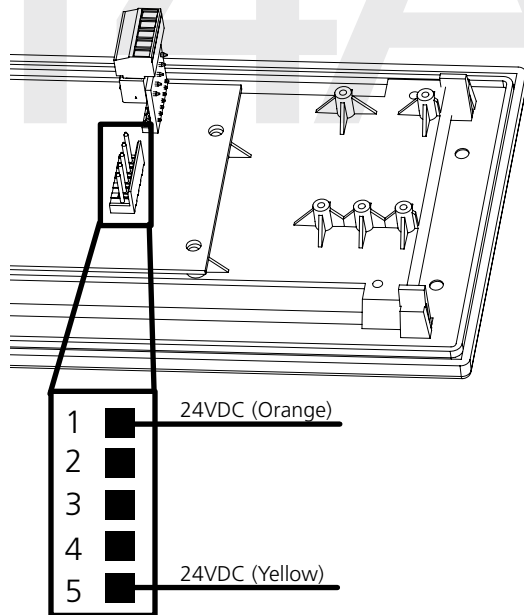
14B) If you are installing 3200 or 3300 series digital clocks that use an RS485 sync system, attach the wires to the port as shown below.

1 2 3 4

Input A (Blue)
Input B (Red)
Output B (Brown)
Output A (Purple)

24VAC/DC (Orange) 1
110/230VAC (Black) 2
Ground (Green) 3
110/230VAC (White) 4
24VAC/DC (Yellow) 5
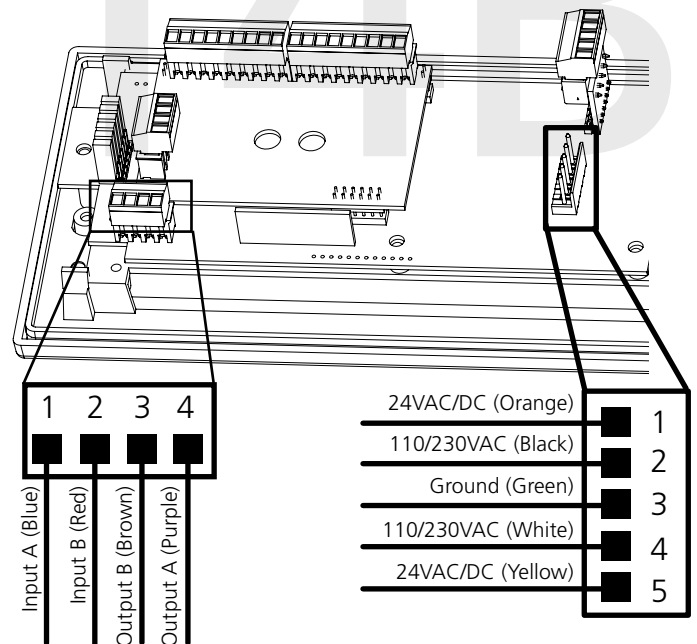
14C) If you are installing 3300 series digital clocks that use a sync system other than 2-wire digital or RS485, attach the wires to the appropriate sync-wire ports. Refer to the section, "Inputs - Clock Side - Sync Wire" for instructions regarding each system.

Sync-Wire Ports

24VAC/DC (Orange) 1
110/230VAC (Black) 2
Ground (Green) 3
110/230VAC (White) 4
24VAC/DC (Yellow) 5
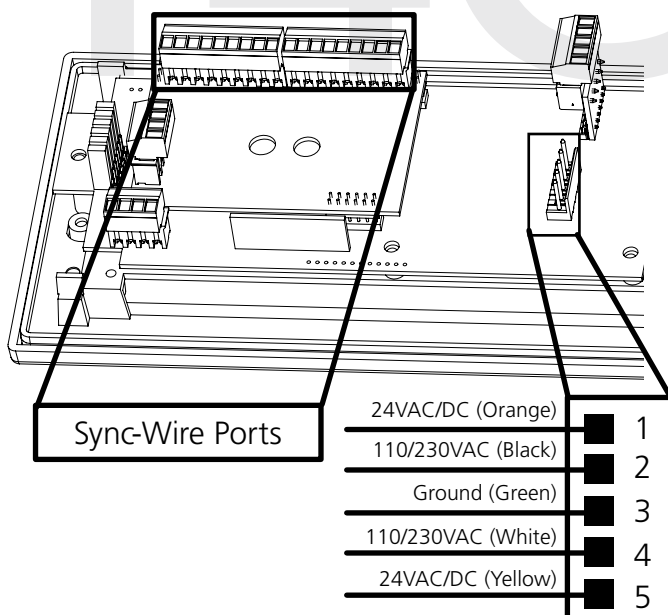
15) Use the M3/5-15x12 screws to attach each display board to the housing.

NOTE: For 2.5" Digit clocks, the holes for the screws will be on the left and right inner surfaces of the housing. For 4.0" Digit Clocks, the holes will be on the top and bottom surfaces.
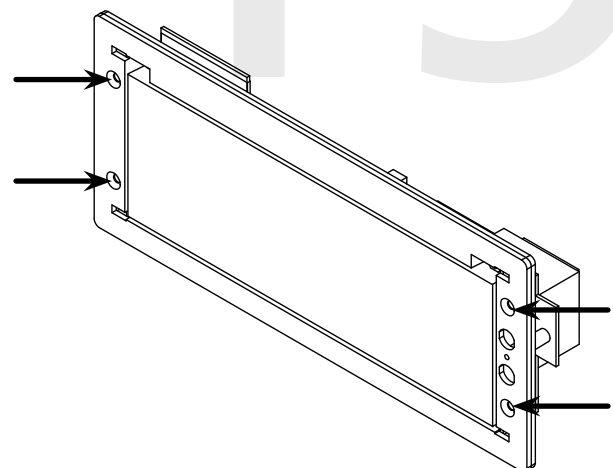
Double Mount Installation

16) Use the M3.5-1.5x12 screws to attach a display board to each housing.

NOTE: For 2.5" Digit clocks, the holes for the screws will be on the left and right inner surfaces of the housing. For 4.0" Digit Clocks, the holes will be on the top and bottom surfaces.
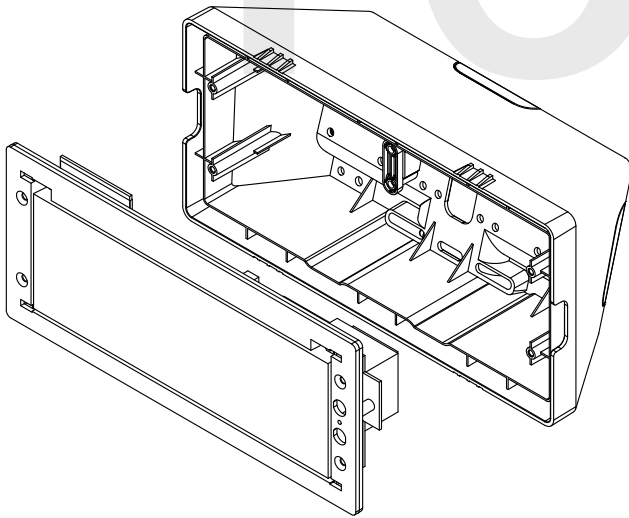
17) Remove the plastic cover from each display board.
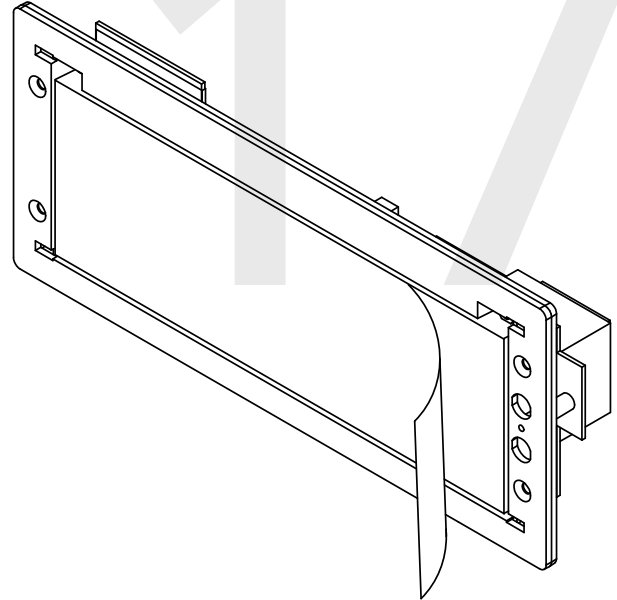
18) Place a filter over each display board. You should hear a snapping noise as the latches drop into place.
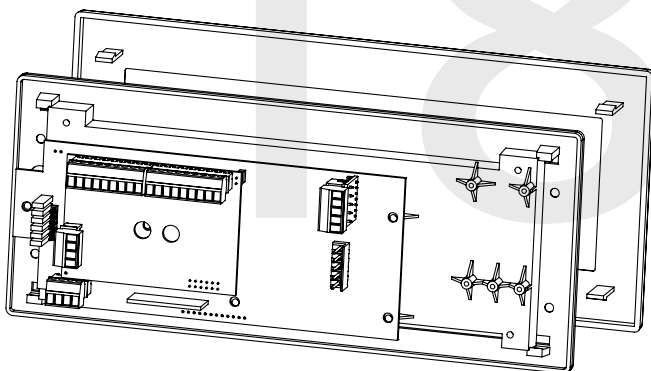
19) Place a housing frame onto each housing. You should hear a snapping noise as the latches drop into place.

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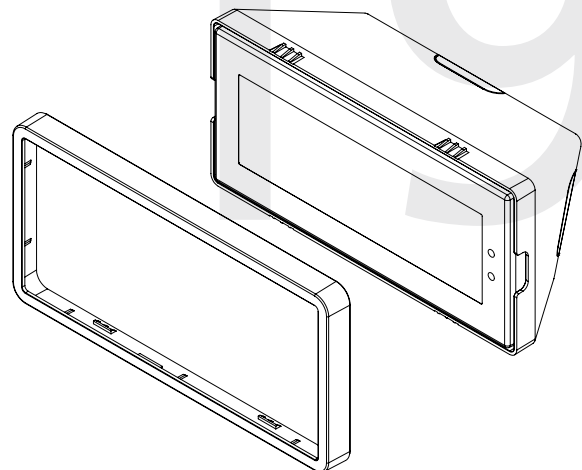
Double Mount Installation

20) Hang the base of the pole on the mounting plate so that the lip is on top of the base, and the holes for the screws are on the bottom of the base. Attach the wires from the pole to the wires in the gang box, then use the two black base screws to attach the other side of the base to the mounting plate.

WALL

CEILING

21) Power the clock. After testing the LED segments and presenting some diagnostic information, the clock will display the time based off if its internal quartz oscillator. It will correct itself to show synchronized time as soon as it receives data from a master clock.

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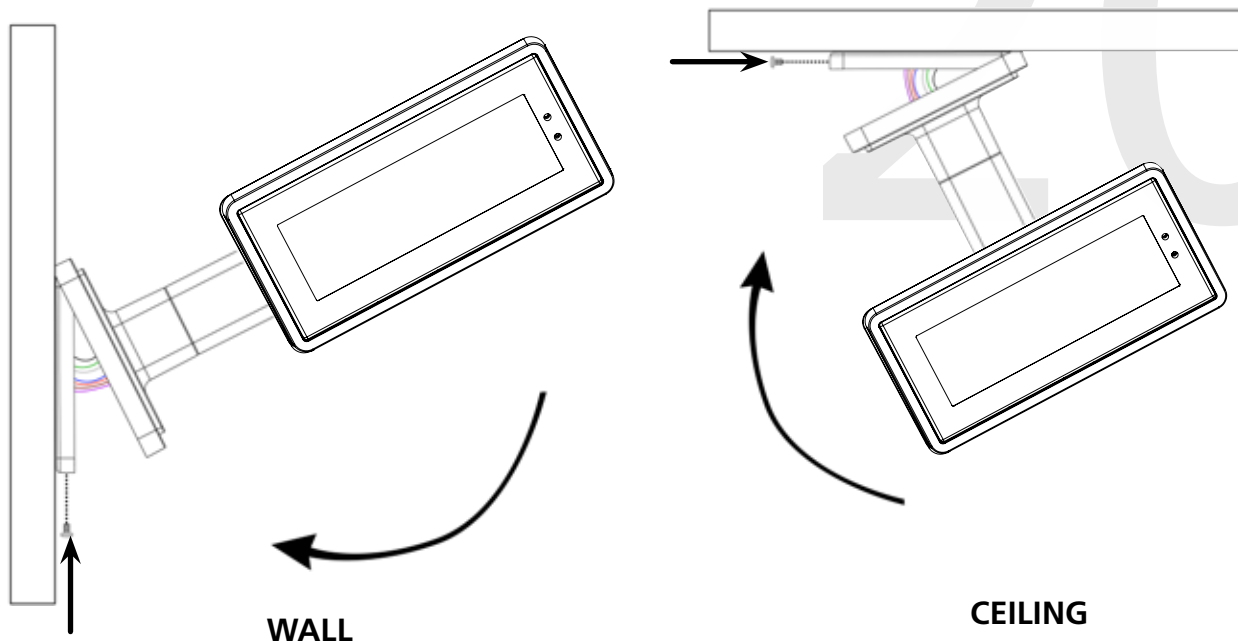
Adjustable Jumper Settings

Every version of the digital clock contains a set of jumpers which can be moved to change a particular setting. The functions and positions of each jumper are described below:

	Left Position	Right Position
	Pins 1 & 2	Pins 2 & 3
Jumper 1	12 Hour Time (Default)	24 Hour Time
Jumper 2	Display High Brightness (Default)	Display Low Brightness
Jumper 3	Display Time Only (Default)	Alternate display between Time and Date
Jumper 4	DO NOT TOUCH (Default)	DO NOT TOUCH
Jumper 5	DO NOT TOUCH (Default)	DO NOT TOUCH
Jumper 6	Clock accepts sync-wire inputs (Default in 24V)	Clock accepts RS485 input or sbdconfig cable (Default in 110/230VAC)
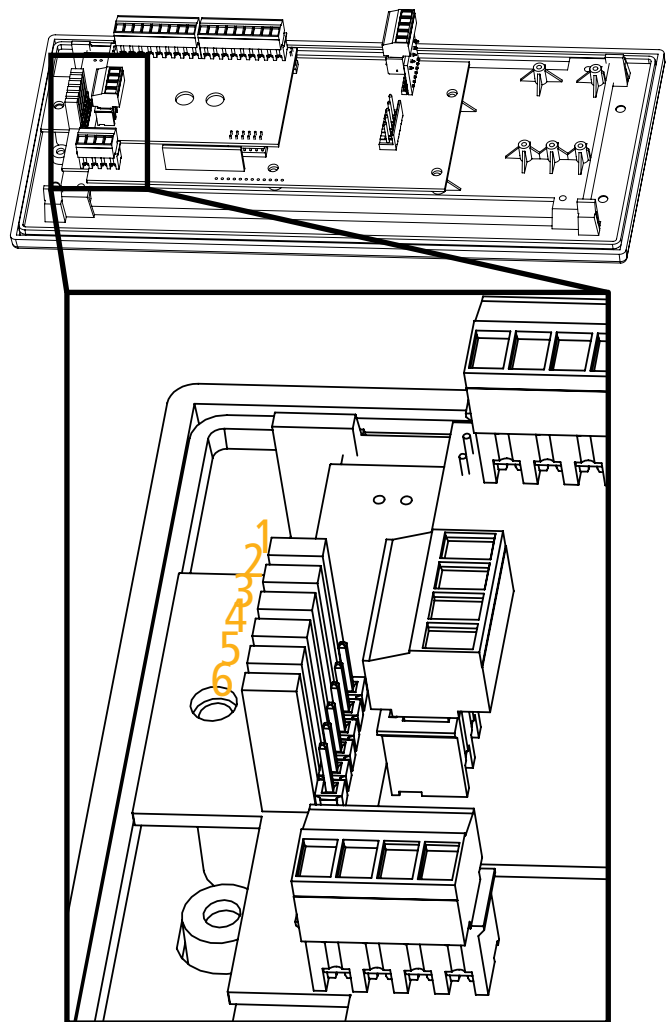
To manually enable or disable the first three jumpers, refer to the section of this manual labeled "Manual Controls" and refer to Setting 15.

Temperature Sensor Installation (3200/3300 Only)

(**IMPORTANT:** Detach clock from power source before installing new circuitry. DO NOT add new circuitry while the clock is operating)

Attach the end of the Temperature Sensor Wire to the circuit board in the following manner:
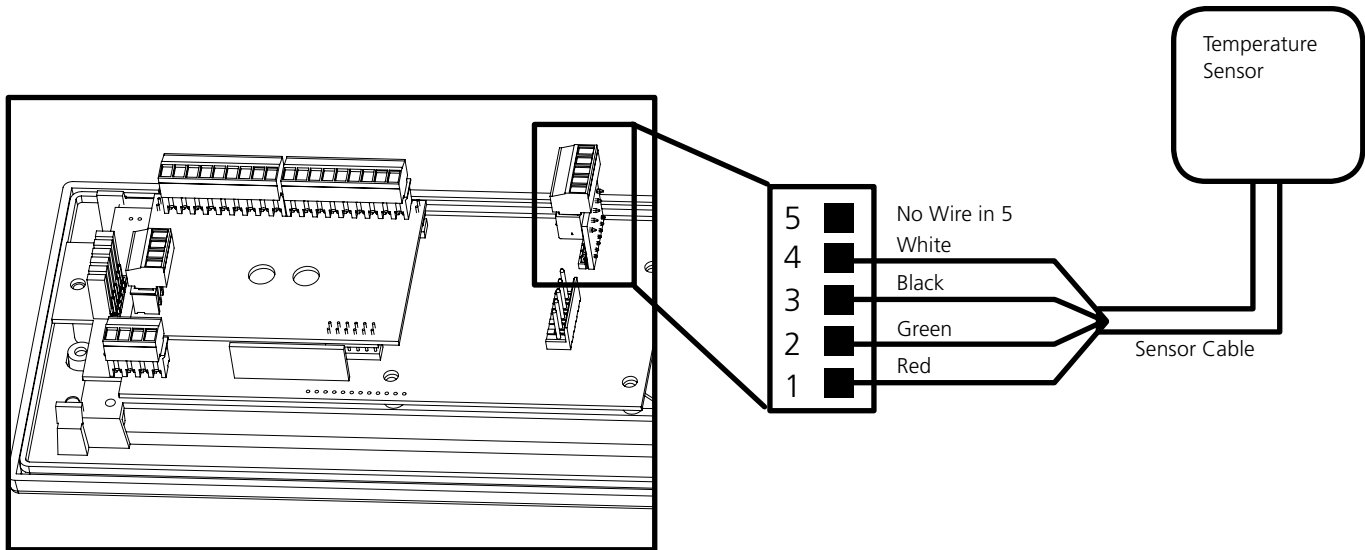
The Sensor Cable is 6 feet (1.83 meters) long, and so the sensor should be positioned within 6 feet of the clock. The cable is unshielded, 4 conductor, 22AWG (.33mm²). If longer than 6 feet is required, the wire would have to be terminated in an electrical box, and the longer wire would have to be provided by the customer.

Data from the temperature sensor will be sent to your clock when the clock is powered on. For more information on how to make the SBD display temperature, please see the section labeled "sbdconfig - Display Settings".

Buzzer Installation (3300 Only)

(**IMPORTANT:** Detach clock from power source before installing new circuitry. DO NOT add new circuitry while the clock is operating)

During installation, there are two port blocks mentioned. The block on the upper-left will be called J1, while the block on the bottom left will be called J3. Refer to the diagram for details. For J1, the ports in the block are listed as 1-9, starting with port 1 on the left, and ending with port 9 on the right. For J3, the ports in the block are listed as 1-4, starting with port 1 on the bottom and port 4 on the top.

The Buzzer can be installed on the clock circuit board with four easy steps:
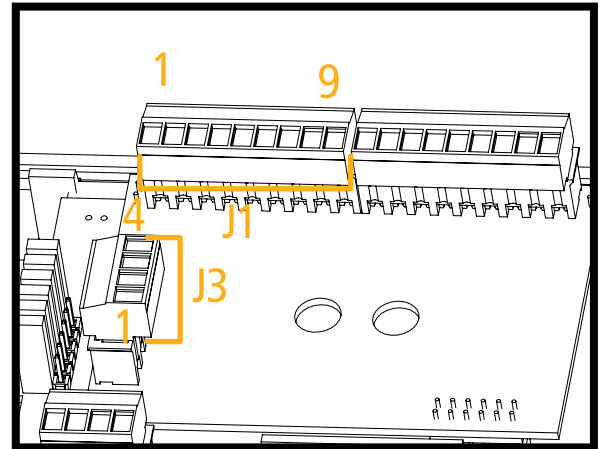
1. Attach the long green connector to the J1 Sync Input ports.
2. Confirm that the wires are attached to holes 7 and 8. The red wire should be in hole 7. The black wire should be in hole 8.
3. Attach the short green connector to the J3 Relay Output ports.
4. Confirm that the wires are attached to holes 1 and 2. The yellow wire should be in hole 1. The black wire should be in hole 2.

To program the buzzer, connect the USB cable to the clock, log onto sbdconfig and perform the following actions:

1. Click on the Elapsed Timer or Inputs tab.
2. Find the drop-down menu next to "On Countdown complete, close" and select "Relay 2"
3. In "for _____ seconds" set the amount of time that you wish the buzzer to sound when the countdown ends. The number must be a whole number from 1 to 60.
4. Press the Update Clock button.

For information on sbdconfig, refer to the sections labeled sbdconfig - Elapsed Timer" or "sbdconfig - Inputs"

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Inputs - System-Side - 2-Wire Digital

SMA Series Master Clock

24V SAM Series Wired Clock

24V SBD 3000 Series Wired Clock

24V SAM Series Wired Clock

When replacing old converter boxes with new ones, the following values are equivalent:

OLD MODEL

CURRENT MODEL

Inputs - System-Side - RS485

SMA Series Master Clock

Clock Circuit
19 18

21 20 19 18

Power

Neutral

Power

Black

White

Ø Ø
24VAC
110VAC
230VAC

Input
Blue
Red

Output
Brown
Purple
Power — Black
Neutral — White
Green
Ground

**24/110/230VAC SRM Series
RS485 Clock**

Input
J7-1
J7-2

Output
J7-3
J7-4
Power — Black/Yellow
Neutral — White/Orange
Green
Ground

RS485

Power

10:00:08

SBD 3200/3300 Series Digital Clock

Input
Blue
Red

Output
Brown
Purple
Power — Black
Neutral — White
Green
Ground

**24/110/230VAC SRM Series
RS485 Clock**

Black & White refer to 110/230VAC
Yellow & Orange wires refer to 24VAC

38

Inputs - System-Side - Sync-Wire 110/230VAC

SMA Series Master Clock

Clock Circuit
27   26
24 or 23

27 | 26 | 25 | 24 | 23 | 22   Clock Circuit 1

or*

27 | 26 | 25 | 24 | 23 | 22   Clock Circuit 2

* "or" means one pair of ports or the other. You cannot, for instance, use port 23 for reset and 27 for power, nor can you use 26 for reset and 24 for power. You must use the pair **24 AND 23** or the pair **26 AND 27**

Black
White

Neutral
Power
Reset

Ø Ø

110VAC or
230VAC

Neutral	White
Power	Black
Reset	Yellow
	Green
Ground	

110/230VAC SAM Series Wired Clock

Neutral	J1-1
Reset	J1-2
Power	Black
Neutral	White
	Green
Ground	

Correction
Power

110/230VAC SBD 3300 Series Wired Clock
Red & Blue Wires are NOT provided by Sapling

Neutral	White
Power	Black
Reset	Yellow
	Green
Ground	

110/230VAC SAM Series Wired Clock

Inputs - System-Side - Sync-Wire 24VAC

SMA Series Master Clock

Clock Circuit
27   26
or
24   23

24VAC

or*

| 27 | 26 | 25 | 24 | 23 | 22 | Clock Circuit 1

| 27 | 26 | 25 | 24 | 23 | 22 | Clock Circuit 2

* "or" means one pair of ports or the other. You cannot, for instance, use port 23 for reset and 27 for power, nor can you use 26 for reset and 24 for power. You must use the pair **24 AND 23** or the pair **26 AND 27**

Neutral	White
Power	Black
Reset	Yellow
	Green
Ground	

24VAC SAM Series Wired Clock

Neutral	J1-1
Reset	J1-3
Power	Yellow
Neutral	Orange
	Green
Ground	

10:00:08

24VAC SBD 3300 Series Wired Clock
Red & Blue Wires are NOT provided by Sapling

Neutral	White
Power	Black
Reset	Yellow
	Green
Ground	

24VAC SAM Series Wired Clock

Refer to Inputs - Sync

Inputs - Clock-Side - Sync-Wire (3300 Only)

Inputs for sync-wire protocols are located on the upper-port block on the back of the clock. For this manual, the ports in each block are listed as 1-9, starting with port 1 on the left, and ending with port 9 on the right.

There are two port blocks. In this manual, the block on the left will be called J1, while the block on the right will be called J2. Refer to the diagram for details.
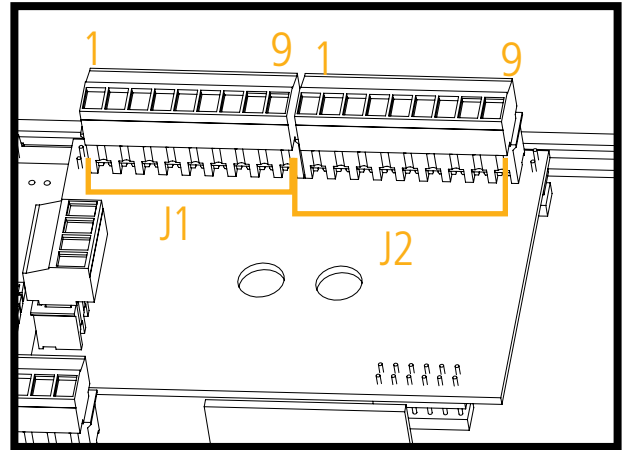
The diagrams on the following pages indicate how wires should be run between the various ports on the clock and the network to allow for the use of Sync-wire protocols.

Before a clock can use these protocols, it must be configured to accept the intended protocol as its input through either the front buttons or sbdconfig. Refer to the sections "Manual Controls" or "sbdconfig - Clock Settings"

59 Minute Correction

110VAC or 230VAC Interface

24VAC Interface

Dry Contact Closure
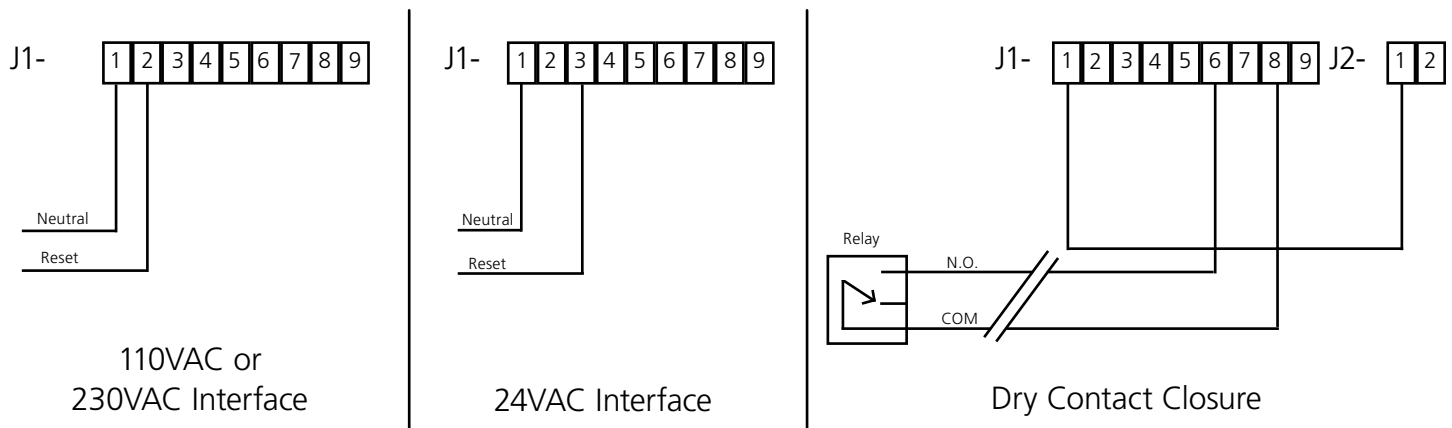
Description:

59 Minute Correction - 110VAC or 230VAC or 24VAC 60 Hz is used to run the clock normally. Applying an eight (8) second reset signal from 57 minutes and 54 seconds will cause an hourly correction. Applying a fourteen (14) second reset signal from 5:57:54 will cause a daily correction.

Inputs - Clock-Side - Sync-Wire

58 Minute Correction

110VAC or
230VAC Interface

24VAC Interface

Dry Contact Closure
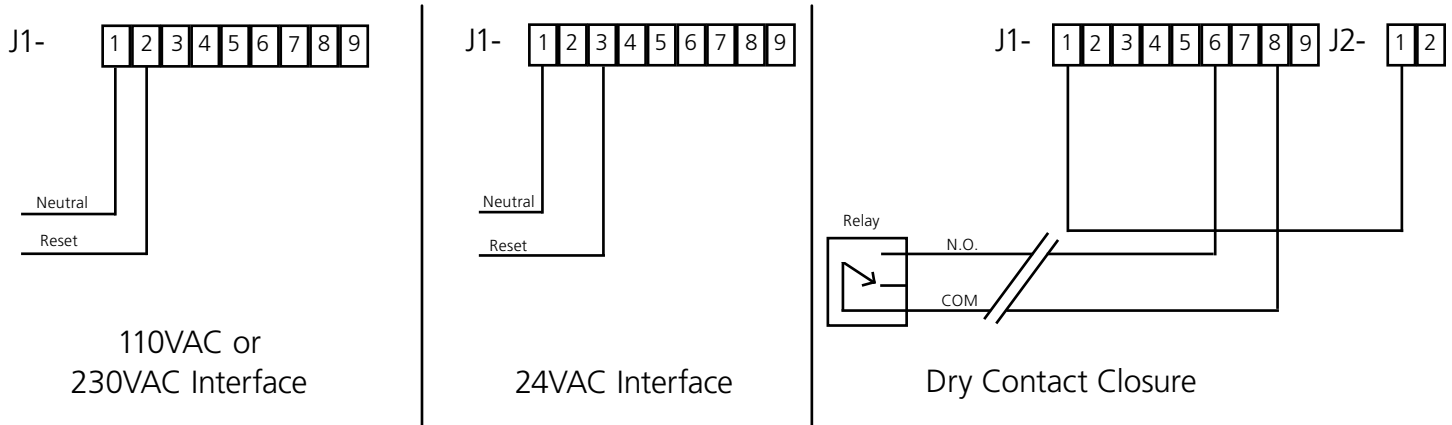
Description:

110VAC or 230VAC or 24VAC 60 Hz is used to run the clock normally. Refer to the table below for the four variations on 58 minute correction:

58th minute (1) - The hourly correction for 55 seconds every hour from XX:58:05 to XX:59:00. The daily correction (5 a.m. & 5 p.m.) is ten correction cycles sent to the relay (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.
58th minute (2) - The hourly correction for 60 seconds every hour from XX:58:00 to XX:59:00. The daily correction (5 a.m. & 5 p.m.) is twelve correction cycles sent to the relay (each for 65 seconds on and 25 seconds off) beginning at 5:05:00 to 5:22:35.
58th minute (3) - The hourly correction for 60 seconds every hour from XX:58:00 to XX:59:00. The daily correction (5 a.m. & 5 p.m.) is twelve correction cycles sent to the relay (each for one minute on and two minutes off) beginning at 5:06:00.
58th minute (4) - The hourly correction for 55 seconds every hour from xx:58:05 to XX:59:00. The daily correction (5 a.m. & 5 p.m.) is 12 correction cycles for 55 seconds. The timings will be 05:03:05, 05:07:05, 05:11:05, 05:15:05, 05:19:05, 05:23:05, 05:27:05, 05:31:05, 05:35:05, 05:39:05, 05:43:05 and 05:47:05.

Inputs - Clock-Side - Sync-Wire

National Time/Rauland

110VAC or
230VAC Interface

24VAC Interface

Dry Contact Closure
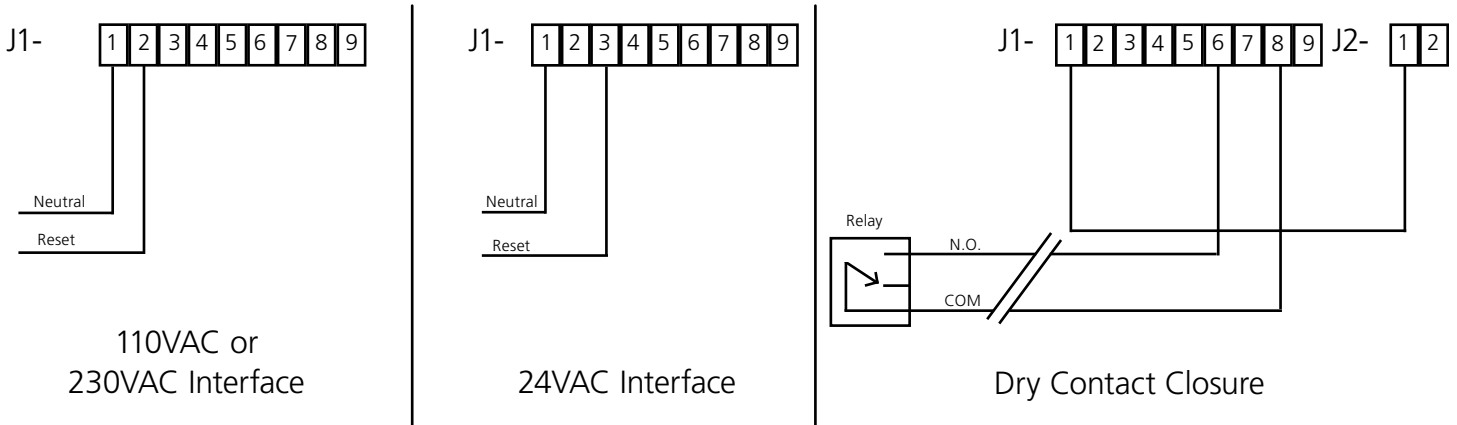
Description:

National Time/Rauland - 110VAC or 230VAC or 24VAC 60 Hz is used to run the clock normally. Applying a 25 second reset signal when minutes equal 00 and seconds equal 00 will cause an hourly correction. Applying a 24 minute reset signal when hours equal 06 or 18 and minutes equal 00 and second equals 25 will cause a daily correction.

Rauland Digital
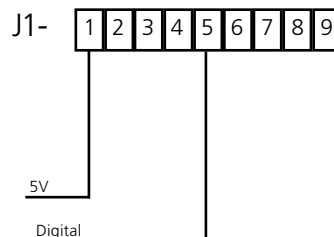
Description:

Rauland Digital - Applying a half second pulse for every minute to the Dig. Line will bring the clock to the correct time. The clock will jump to the correct time at the end of the correction pulse.

Note: For better synchronization, it is recommended to work on a 60 Hz time base.

Note: Use only an isolated transformer to run the clock in 24 volt mode.

Inputs - Clock-Side - Sync-Wire

Dukane

J1- | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | J2- | 1 | 2 |

Reset

Minute Pulse

Ground
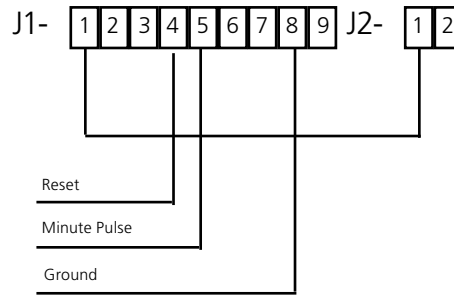
Description:

Dukane - Applying a 4-10 millisecond pulse on the minute line will increment the clock in one minute.

Applying a 12-50 millisecond pulse on the reset line will bring the clock back to 12:00 a.m.

Midnight Reset or Once a Day Pulse

J1- | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Neutral

Reset

**110VAC or
230VAC Interface**

J1- | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Neutral

Reset

24VAC Interface

J1- | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | J2- | 1 | 2 |

Relay

N.O.

COM

Dry Contact Closure
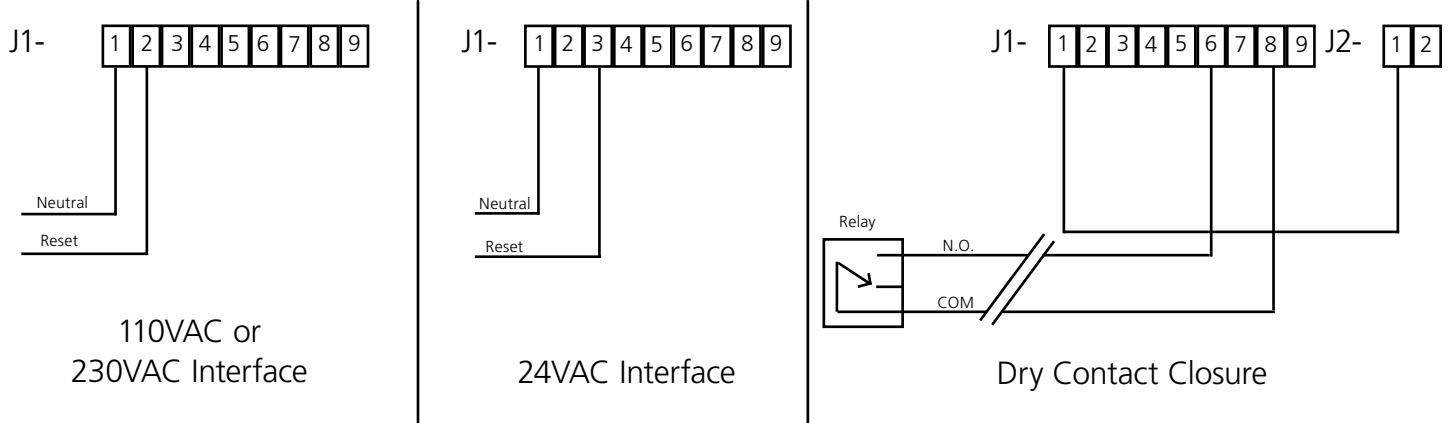
Description:

Midnight Reset or Once a Day Pulse - Applying a pulse for more than two (2) seconds will bring the clock to the correct time.

Inputs - Clock-Side - User Inputs

User Inputs
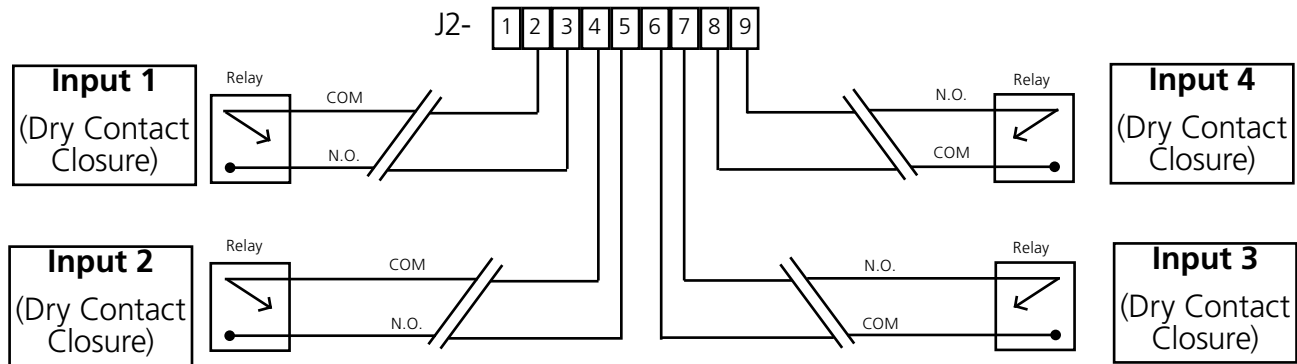
Use a dry contact closure between any of the two lines shown above to activate one of the numbered user inputs. This input is a *dry contact closure*, which means that **the user should not be providing external power on either of the lines leading from the relay to the clock.** The dry contact closure only needs to complete the circuit when activated, and can be a simple switch or button.

To configure what a given input does to the clock when activated, refer to the section of this manual labeled "sbdconfig - Inputs."

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USA

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www.sapling-inc.com

Outputs (3300 Only)

RS485 and 2-Wire Digital - Master Mode

During a loss of communication with the Master Clock, the 3300 digital clock can act as a temporary, backup master clock for other clocks in the system. The port block on the bottom left side of the circuit board will be called J7. Refer to the diagram for details. For J7, the ports in the block are listed as 1-4, starting with port 1 on the left and port 4 on the right.
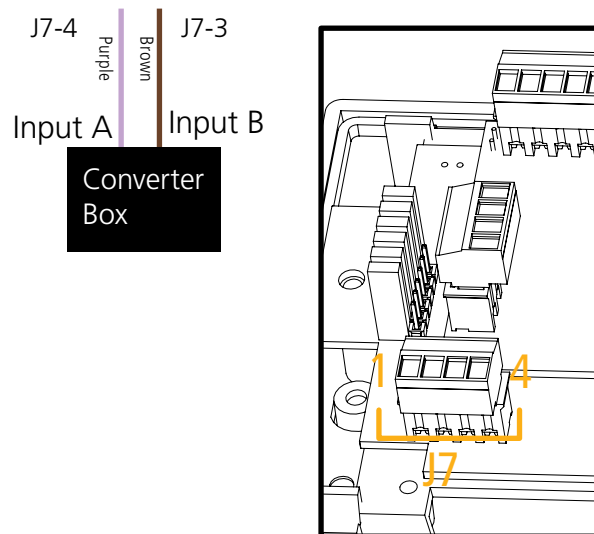
Output Relays

(**IMPORTANT:** Detach clock from power source before installing new circuitry. DO NOT add new circuitry while the clock is operating)

The port block on bottom left will be called J3. Refer to the diagram for details. For J3, the ports in the block are listed as 1-4, starting with port 1 on the bottom and port 4 on the top.
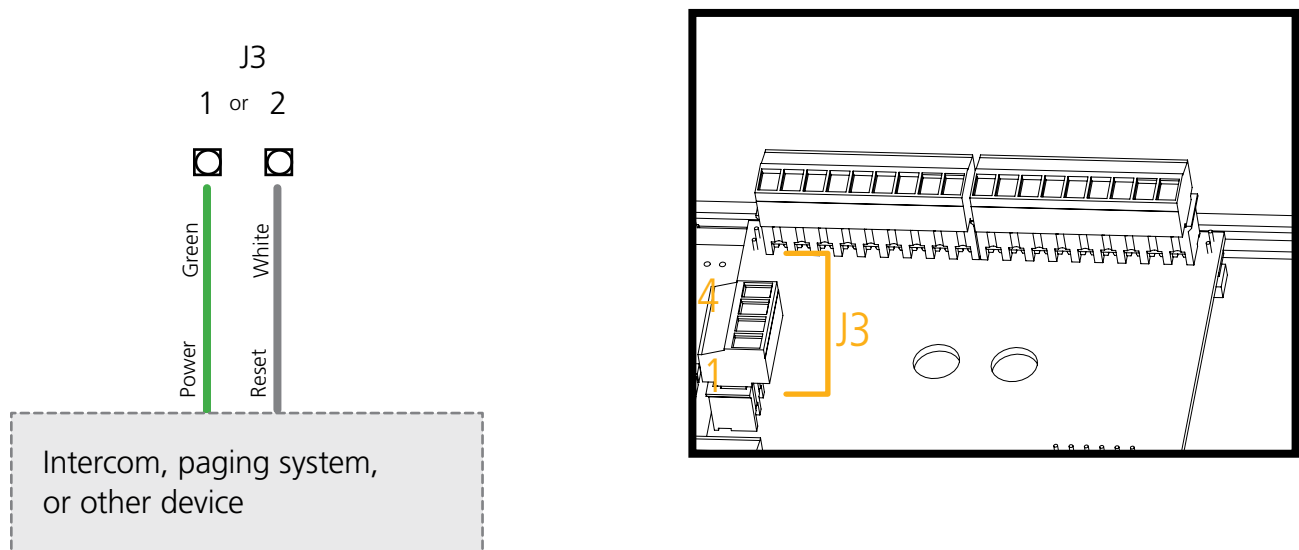
Manual Controls (3300 Only)

The purpose of this section is to get a new digital clock up and running using the manual controls on the front of the digital clock. If you would prefer to program the master clock through the convenience of a graphic interface, go to the section labeled "sbdconfig - Setting up sbdconfig.exe" for an alternate programming method.

Although **we always recommend that the Digital Clock receive time data from an accurate time source**, if there is a need for the digital clock to act as a standalone device, the Digital Clock's internal real-time clock can be set manually. This can be done by pressing the top button to advance the hour, and the bottom button to advance the minute.

Top Button (Hour)

Bottom Button (Minute)

For all other settings, press and release both buttons simultaneously. To return the LED display to showing the time, repeatedly press the top button until all of the setting codes have been cycled through. The last code should be 41--99.

The numbers shown on the left are examples. Going down the list and entering every one of the examples exactly as shown will cause the clock to malfunction or use incorrect data. Program your clock setting based off of the instructions in the description on the right.

Setting 1 - Set Year

Use the bottom button to scroll from 00 through 99. This permits the user to select a year from 2000 to 2099.

Setting 2 - Set Month

Use the bottom button to scroll from 01 through 12. This permits the user to select a month from January (01) to December (12).

Setting 3 - Set Day of the Month

Use the bottom button to scroll from 01 through 31. This permits the user to select a day from the 1st of the month to the 31st of the month.

Setting 4 - 12/24 Hour Mode

Press the bottom button to switch between 12 and 24.
12 causes the master clock to display time in 12 Hour mode.
24 causes the master clock to display time in 24 Hour mode.

Manual Controls

The numbers shown on the left are examples. Going down the list and entering every one of the examples exactly as shown will cause the clock to malfunction or use incorrect data. Program your clock setting based off of the instructions in the description on the right.

5   d

Setting 5 - Daylight Saving Time

Press the bottom button to switch between "d' or "E"
"d" disables Daylight Saving Time
"E" enables Daylight Saving Time

NOTE: Daylight Savings Time set through this method begins on the second Sunday of March at 2:00 AM, and ends on the first Sunday of November at 2:00 AM. If your state/province/country follows a different set of DST rules, please use sbdconfig to configure this setting.

6   d

Setting 6 - Alternate Date and Time

Press the bottom button to switch between "d' or "E"
"d" disables Alternating Time and Date
"E" enables Alternating Time and Date

NOTE: Alternating Time and Date set through this method displays the time for seven seconds, then displays the date for three seconds, then repeats. To make the time or date appear for longer or shorter periods of time, please use sbdconfig to configure this setting.

7   E

Setting 7 - Date Format

Allows the user to chose the Date format used when the clock is set to display alternating Date/Time. Press the bottom button to switch between "A" or "E"

"A" Stands for American Style - Month:Day:Year

"E" Stands for European Style - Day:Month:Year

On a 4-digit clock, only the day and month will be displayed.

8   02

Setting 8 - Display Brightness

Allows the user to choose the brightness level for the clock's main display. Press the bottom button to cycle between values 00, 01, and 02. This values correspond to Low, Medium, and High (Default)

A user has the ability to create a brightness schedule for the clock, but the parameters for this schedule must be set using the sbdconfig software.

Manual Controls

The numbers shown on the left are examples. Going down the list and entering every one of the examples exactly as shown will cause the clock to malfunction or use incorrect data. Program your clock setting based off of the instructions in the description on the right.

Setting 9 - Clock I.D. Number

Press the bottom button to advance the ID number of the clock. This accepts the ID numbers 1 through 999.
The ID Number is used for displaying text messages like 911, bELL, and FirE. Consult the Master Clock manual for more information.

This value can also be set through sbdconfig.

Setting 10 - Zone Number

Press the bottom button to advance the ID number of the clock. This accepts the Zone Numbers 01 through 99.
The Zone Number is used for displaying text messages like 911, bELL, and FirE. Consult the Master Clock manual for more information.

This value can also be set through sbdconfig.

Setting 11 - RS485 Data Transmission Rate

Allows the user to set the data transmission rate for RS485 output on 3300 digital clock models. Press the bottom button to switch between the numerical options below:

00 - No data is sent	05 - Data sent every 30 seconds	10 - Data sent every 15 minutes
01 - Data sent every second	06 - Data sent every minute	11 - Data sent every 30 minutes
02 - Data sent every 5 seconds	07 - Data sent every 2 minutes	12 - Data sent every hour
03 - Data sent every 10 seconds	08 - Data sent every 5 minutes	NOTE: Data is sent **once** per each
04 - Data sent every 15 seconds	09 - Data sent every 10 minutes	of the ranges listed (except in 00).

Setting 13 - Enable Loss of Communication Alert

Press the bottom button to switch between "d' or "E"
"d" disables Loss of Communication Alert
"E" enables Loss of Communication Alert

When Loss of Communication Alert is enabled, the colons on the display will blink if the digital clock fails to synchronize with the master clock within a set amount of time. This amount of time is set through Setting 14.

Manual Controls

The numbers shown on the left are examples. Going down the list and entering every one of the examples exactly as shown will cause the clock to malfunction or use incorrect data. Program your clock setting based off of the instructions in the description on the right.

14   06

Setting 14 - Loss of Communication Alert Additional Configuration

Allows the user to determine how much time should pass without a synchronization signal from the master clock before the Loss of Communication Alert is activated. Press the bottom button to switch between the numerical options below:

01 - Activates after 5 minutes	05 - Activates after 45 minutes	09 - Activates after 180 minutes
02 - Activates after 10 minutes	06 - Activates after 60 minutes	10 - Activates after 240 minutes
03 - Activates after 15 minutes	07 - Activates after 90 minutes	Note: Alert activates after signal
04 - Activates after 30 minutes	08 - Activates after 120 minutes	loss for the time limit specified

15   d

Setting 15 - Enable Circuit Board Jumpers

Press the bottom button to switch between "d' or "E"
"d" disables the jumpers
"E" enables the jumpers

NOTE: Enabling the jumpers overrides Settings 4, 6, and 8. Refer to the section of this manual labeled "Adjustable Jumper Settings" for information on the function of each jumper.

Manual Controls

The numbers shown on the left are examples. Going down the list and entering every one of the examples exactly as shown will cause the clock to malfunction or use incorrect data. Program your clock setting based off of the instructions in the description on the right.

Setting 20 - **Set the Programmable Relay 1**

Press the bottom button to scroll from 1 to 9 or **d**. These numbers correspond to different protocols, specifically:

1) **58th Minute (1) -** The clock performs an hourly correction that takes 55 seconds and occurs between XX:58:05 and XX:59:00 of every hour. It also performs two daily corrections: one at 5:00AM and another at 5:00PM. Each daily correction is ten relay cycles, each cycle is 95 seconds long, and the cycles begin at 5:05AM/PM, 5:07, 5:09, 5:11, 5:13, 5:15, 5:17, 5:19, 5:21, and 5:23 respectively.

2) **58th Minute (2) -** The clock performs an hourly correction that takes 60 seconds and occurs between XX:58:00 and XX:59:00. It also performs two daily corrections: one at 5:00AM and one at 5:00PM. Each daily correction is made of twelve relay cycles, and each cycle consists of 65 seconds on and 25 seconds off

3) **58th Minute (3) -** The clock performs an hourly correction that takes 60 seconds and occurs between XX:58:00 and XX:59:00. It also performs two daily corrections: one at 5:00AM and one at 5:00PM. Each daily correction is made of twelve relay cycles, and each cycle consists of 60 seconds on and 120 seconds off.

4) **58th Minute (4) -** The clock performs an hourly correction that takes 55 seconds and occurs between XX:59:05 and XX:59:00. It also performs two daily corrections: one at 5:00AM and one at 5:00PM. Each daily correction is made of twelve relay cycles, each cycle is 55 seconds long, and the cycles begin at 5:03:05AM/PM, 5:07:05, 5:11:05, 5:15:05, 5:19:05, 5:23:05, 5:27:05, 5:31:05, 5:35:05, 5:39:05, 5:43:05, and 5:47:05 respectively.

5) **59th Minute -** The clock performs an hourly correction that takes 8 seconds and occurs between XX:57:54 and XX:58:02. It also performs two daily corrections: one at 5:00AM and one at 5:00PM. Each daily correction is a single 14 second pulse which lasts from 5:57:54 to 5:58:08.

6) **National time & Rauland (1) -** The clock performs an hourly correction that takes 25 seconds and occurs between XX:00:00 and XX:00:25. It also performs two daily corrections: one at 6:00AM and one at 6:00PM. Each daily correction is made of twenty four relay cycles consisting of 25 seconds on, followed by 35 seconds off.

7) **National Time & Rauland (2) -** The clock performs an hourly correction that takes 25 seconds and occurs between XX:00:00 and XX:00:25. It also performs two daily corrections at 6:00:25AM and 6:00:25PM. Each daily correction is a single 24 minute pulse which lasts from 6:00:25AM/PM to 6:24:25.

8) **Rauland Digital -** The clock will reset the secondary clock to 12:00:00AM, then advance the time on the secondary clock by one minute for every 0.5 seconds that the Digital line is shorted to ground.

9) **Once a Day Pulse -** The clock relay will close at a specific time and for an amount of time decided by the clock circuit settings (Settings 21-24 for circuit 1, or 26-29 for circuit 2).

10) **Disable Relay -** The relay is disabled. This is the default value for this function.

Manual Controls

The numbers shown on the left are examples. Going down the list and entering every one of the examples exactly as shown will cause the clock to malfunction or use incorrect data. Program your clock setting based off of the instructions in the description on the right.

21 14

Setting 21 - Once a Day Pulse Output - Set Hour

This setting only appears if "9" was selected under Setting 20. Press the bottom button to scroll from 00 to 23. For example, a value of 13 is the same as 1:00PM. **Set to 0 by default**.

22 00

Setting 22 - Once a Day Pulse Output - Set Minutes

This setting only appears if "9" was selected under Setting 20. Press the bottom button to scroll from 00 to 59. **Set to 0 by default**.

23 30

Setting 23 - Once a Day Pulse Output - Set Seconds

This setting only appears if "9" was selected under Setting 20. Press the bottom button to scroll from 00 to 59. **Set to 0 by default**.

24 05

Setting 24 - Once a Day Pulse Output - Set Pulse Duration

This setting only appears if "9" was selected under Setting 20. Press the bottom button to scroll from 00 to 99. For example, a value of 98 will set a pulse duration of 1 minute and 38 seconds. **Set to 3 by default**.

30 1

Setting 30 - Set Sync Wire Time Input Type

Allows the user to configure the sync wire type used as an Input.

Press the bottom button to scroll from 1 to 9 or **d**. These numbers correspond to the different protocols listed below. **Set to 8 by default**.

d - Disable Auxiliary Input	01 - 58 Minute Correction (1)	02 - 58 Minute Correction (2)	09 - Once a Day Pulse
03 - 58 Minute Correction (3)	04 - 58 Minute Correction (4)	05 - 59 Minute Correction	
06 - National Time/Rauland	07 - Dukane Digital	08 - Rauland Digital	

31 14

Setting 31 - Once a Day Pulse Input - Set Hour

This setting only appears if "8" was selected under Setting 20. Press the bottom button to scroll from 00 to 23. For example, a value of 13 is the same as 1:00PM. **Set to 0 by default**.

32 00

Setting 32 - Once a Day Pulse Input - Set Minutes

This setting only appears if "8" was selected under Setting 20. Press the bottom button to scroll from 00 to 59. **Set to 0 by default**.

33 30

Setting 33 - Once a Day Pulse Input - Set Seconds

This setting only appears if "8" was selected under Setting 20. Press the bottom button to scroll from 00 to 59. **Set to 0 by default**.

Manual Controls

The numbers shown on the left are examples. Going down the list and entering every one of the examples exactly as shown will cause the clock to malfunction or use incorrect data. Program your clock setting based off of the instructions in the description on the right.

The settings below only apply to Sapling analog clocks using wired communication protocols such as 2-Wire Digital or RS485. The digital clock cannot send these commands to Wireless, IP or Wi-Fi clocks.

40   d

Setting 40 - Command Analog Clock to Perform Diagnostic

Allows the user to send a command to all analog clocks receiving data from this digital clock. The available commands are the diagnostic tests listed in the table below:

01 - Diagnostic 1 - Protocol Verification	03 - Diagnostic 3 - Resets clock to Manufacturing Default and sets all hands to 12	05 - Diagnostic 4 - Full Mechanical and Electrical Test. Begins automatically.
02 - Diagnostic 2 - Comprehensive Test	04 - Diagnostic 4 - Full Mechanical and Electrical Test. Press button on analog to start.	09 - Override diagnostic tests and return analog clocks to showing master clock time.
d - Does not send a command		

Details on the function of each diagnostic test can be found in the analog clock manual.

41   60

Setting 41 - Diagnostic Results Display Duration

This setting determines how long the results of a diagnostic test will remain on the face of an analog clock. Due to the nature of the tests, this time period only applies if values 01 or 02 were selected for Setting 40.

Press the bottom button to scroll from 00 to 99. For example, a value of 98 will set a display duration of 1 minute and 38 seconds.

Pressing the top button after Setting 41 will cause the clock to return to the normal time display.

sbdconfig - Connecting to the Clock

The USB to RS485 converter cable has two ends.

One end is a USB-A adapter and will work with any USB-A port. USB-A is a rectangular-shaped port and is included on most desktop and laptop computers produced since 2000. When inserting the USB-A adapter into the USB-A port, confirm that the metal contacts on the adapter are facing the metal contacts on the port connector. The adapter is not reversible, and will not function if installed upside down.

The other end of the cable is an RS485 adapter. It should be installed in the RS485 port on the digital clock, shown in the figure to the right. The adapter must be inserted all the way into the port, or else the cable will not function, even if the computer on the USB side detects the cable.

Confirm that Jumper 6 has been moved to pins 2 and 3. Refer to "Adjustable Jumper Settings" for details.

USB-A Port

Port Connector
Adapter in this space
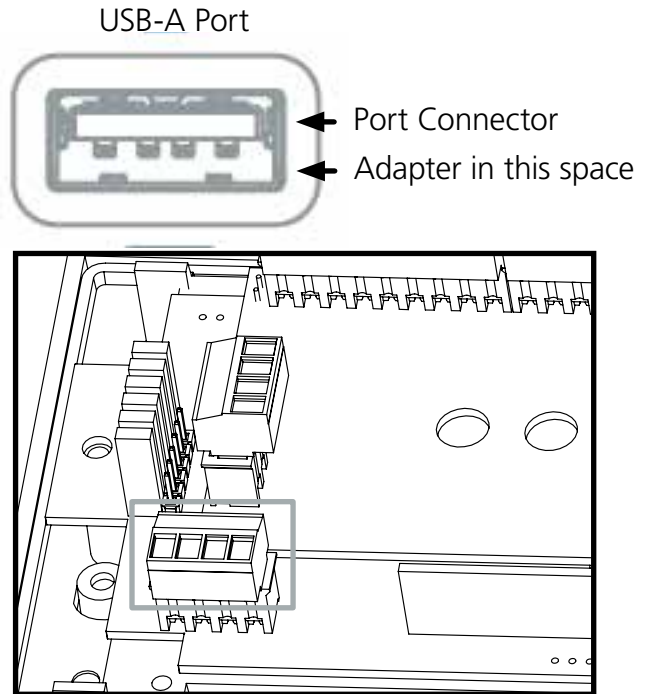
sbdconfig - Setting up sbdconfig.exe

Please Note:

- The sbdconfig.exe software only works with the SBD 3200 or 3300 series.
- Sapling's USB to RS485 converter needs to be purchased separately. Other USB to RS485 converters will not work.
- When using the sbdconfig software, ensure JP6 is on Pins 2&3 on the back of the digital clock board.
- SBD 3200/3300 clocks shipped before March 27, 2014 require an older version of the sbdconfig software, while SBD 3200/3300 clocks shipped after March 27, 2014 require a newer version of the sbdconfig software. If your clock does not respond to your version of sbdconfig, you may request both versions of the program by contacting support at +1 (215)-322-6063.

Windows Operating Systems

1. Insert the USB to RS485 converter into a USB connector port. Refer to "sbdconfig - Connecting to the Clock" for details.

Note: If computer does not recognize the USB to RS485 converter after it is plugged in, unplug the converter, rotate it, and plug it back into the USB port.

2. Plug in the USB to RS485 converter into the J7 port on the board, located on the back of the digital clock.
3. Power up the digital clock.
4. Computer will indicate 'Found New Hardware.'
5. It will then display, 'New Hardware Installed.'
6. A. For Windows 7, click on Start menu --> Control Panel --> Hardware and Sound.--> Devices and Printers-->"Device Manager"
6. B. For Windows 8 and 10, right-click on the Start button. From the list that appears, click on "Device Manager".

sbdconfig - Setting up sbdconfig.exe (ctd.)
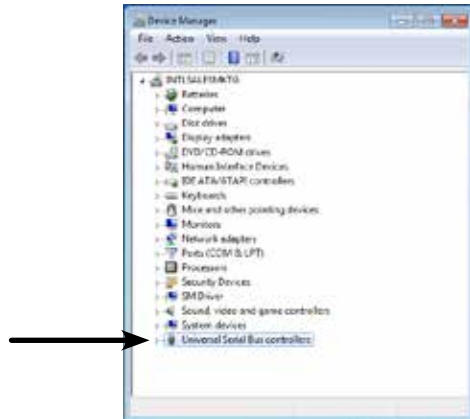
7. Scroll down to Universal Serial Bus controllers and click the + sign to open.
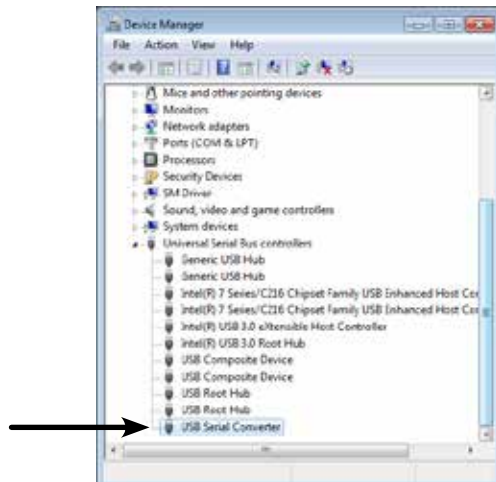
8. Double-click on the "USB Serial Converter" and a new window will open.

If the USB Serial Converter does not appear, look for a new item called USB Half UART under the Device Manager category "Other Devices". Within five minutes, the Device Manager will refresh, the USB Half UART will vanish, and the USB Serial Converter will be listed in the correct category. This will often happen the first time that the cable is being used with a new computer, and rarely happens after that.
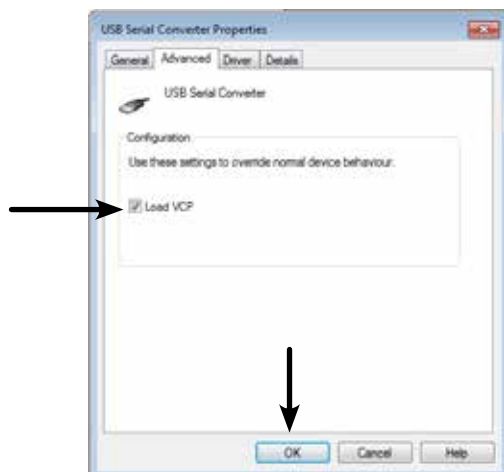
9. Click in the Advanced tab and check the box next to 'Load VCP' and click OK.

56

sbdconfig - Setting up sbdconfig.exe (ctd.)
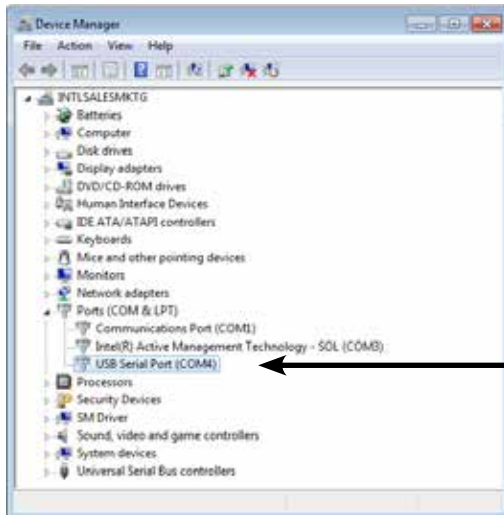
10. Remove RS485 device from the USB port, wait 5 seconds, and plug it back into USB port.

11. Open the Device Manager and scroll to Ports. Make note of which port the USB Serial Port is assigned to. For example: (COM 4).
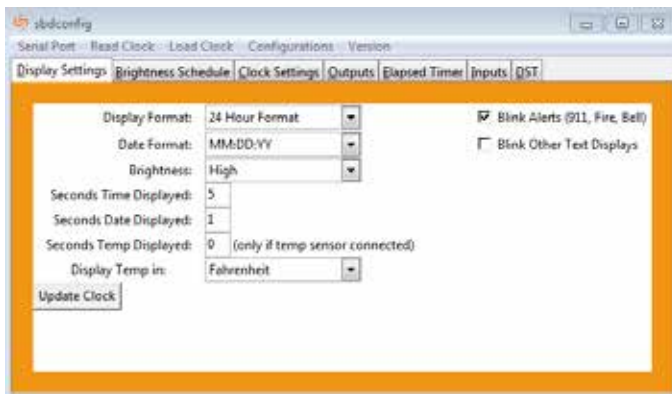
12. Load the sbdconfig.exe software from disk (provided with the digital clock) or copy the software to the desktop.
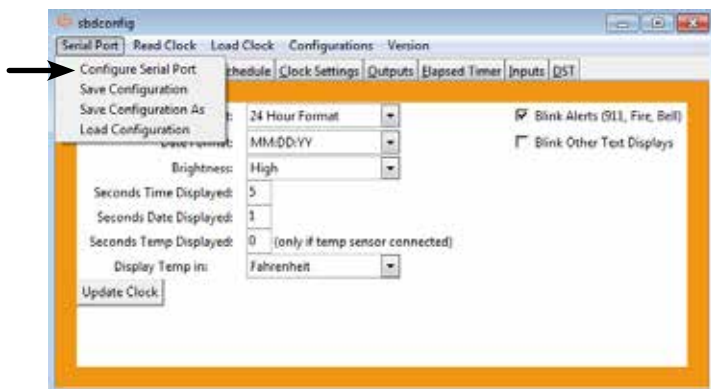
13. Open the sbdconfig software, click on Serial Port (in the menu bar) --> Configure Serial Port. Match the Com port on the sbdconfig software to the USB Serial Port in the Device Manager.

sbdconfig - Setting up sbdconfig.exe (ctd.)
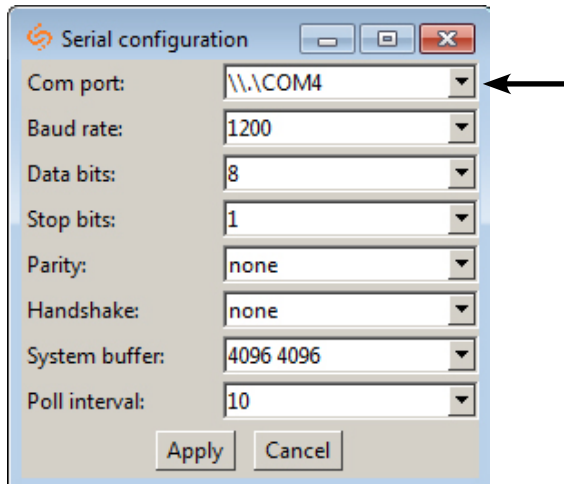
14. Make sure that the Com port number matches the number you saw on the Device Manager, then click apply.
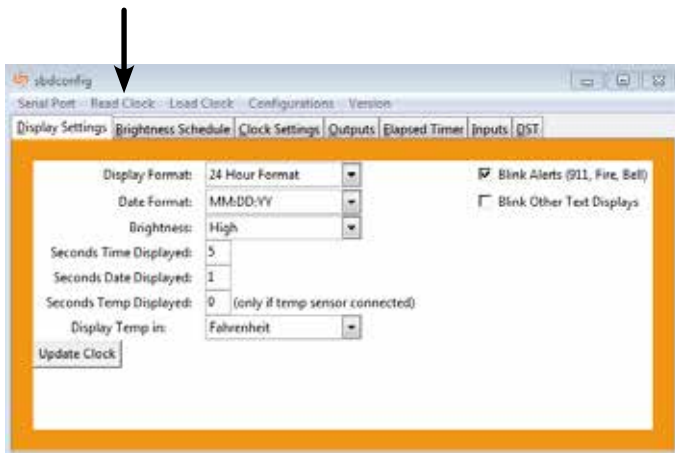
15. Click the 'Read Clock' button. The default settings will populate the tabs on the sbdconfig software. Once the 'Read Clock' button is clicked, another window will open that will signify the upload process.
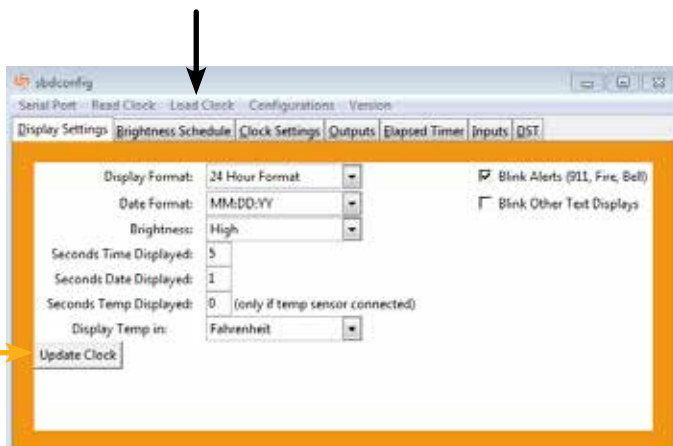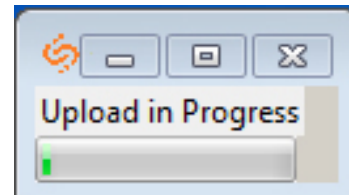
16. You may now edit the clock settings with the sbdconfig program. These settings may be applied to the clock by pressing the update clock button on each tab, or the load clock button in the task bar at the top of the window.

sbdconfig - Task Bar

Located on the task bar of the sbdconfig software, there are five options to choose from: Serial Port, Read Clock, Load Clock, Configurations, and Version.
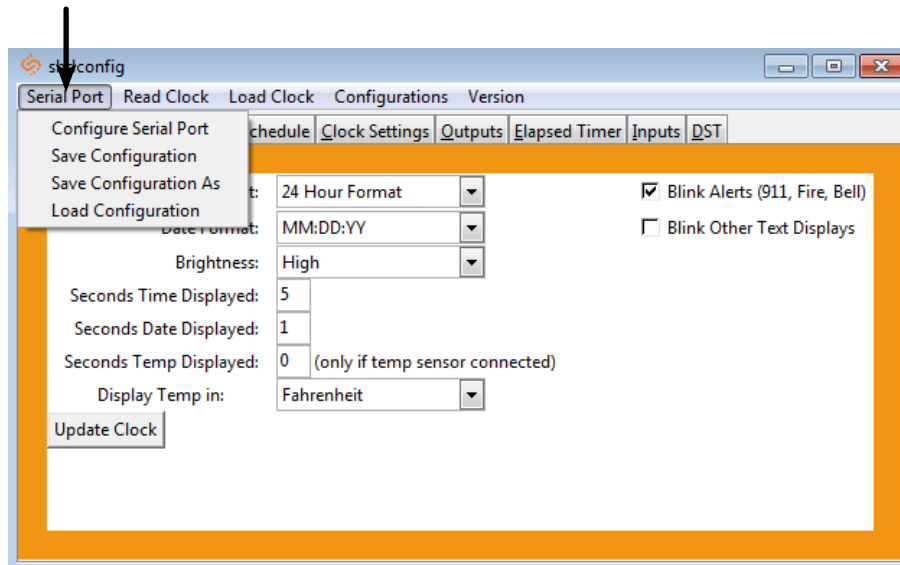
Serial Port

- **Configure Serial Port:** When clicked, this option will open the settings for the serial port (Fig. 1). This is where a user can manage the settings that connect a PC to the digital clock.

- **Save Configuration:** After a user sets the serial port's settings on the sbdconfig software, this option will save a particular configuration to a computer in order to upload it to a different clock.

- **Save Configuration As:** If a user modifies the serial port's settings, this option will save a copy of the reconfigured clock to a computer.

(Fig. 1)

- **Load Configuration:** This option allows a user to upload a previously saved serial port's configuration to the sbdconfig software. Once a digital clock is connected to a computer via the USB to RS485 converter, click the 'Load Configuration' option.
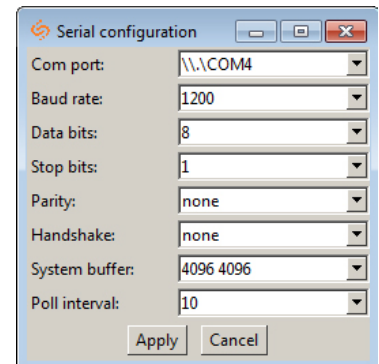
Note: When any of the above options listed under the Serial Port tab are selected, they only apply to the Serial Configuration settings.

sbdconfig - Task Bar (ctd.)

Read Clock

- If a user has a previously configured clock and connects it to a computer, this option will read and upload the settings to the sbdconfig software program. Once the 'Read Clock' button is clicked, another window will open that will signify the upload process (Fig. 2).
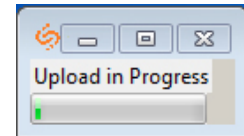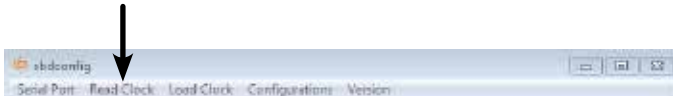
(Fig. 2)

Load Clock

- The 'Load Clock' button will allow a user to change multiple settings within the SBDconfig software tabs. This eliminates the need to click 'Update Clock' on each screen. When the 'Load Clock' button is clicked, another window will open showing that the download is in progress (Fig. 3).
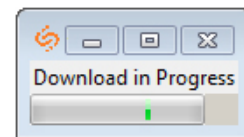
(Fig. 3)

Configurations

- Save Configuration: After the clock's settings are chosen, this option will save the configuration to the computer.
- Load Configuration: This option will allow a user to load the previously saved configuration from the computer.
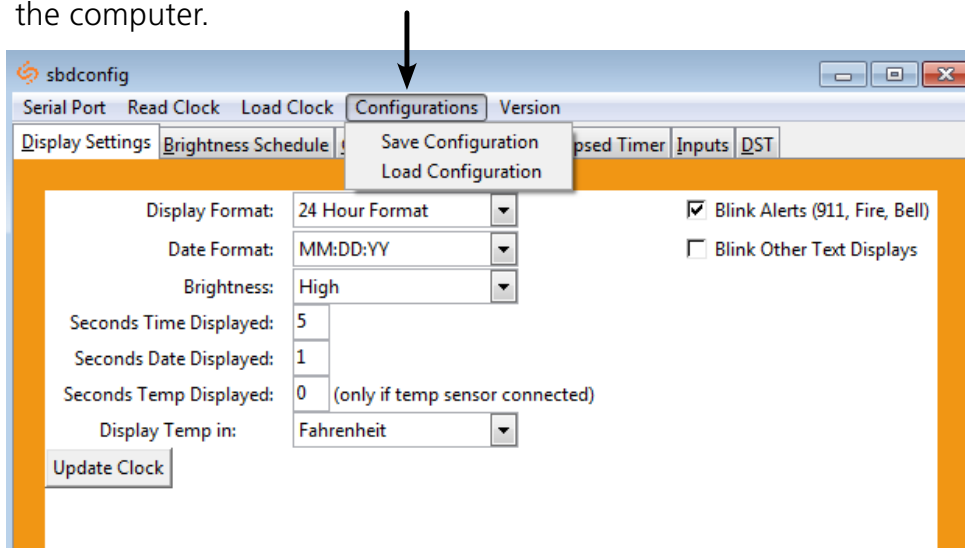
Version

- The Version button displays the number of the software version.

sbdconfig - Display Settings
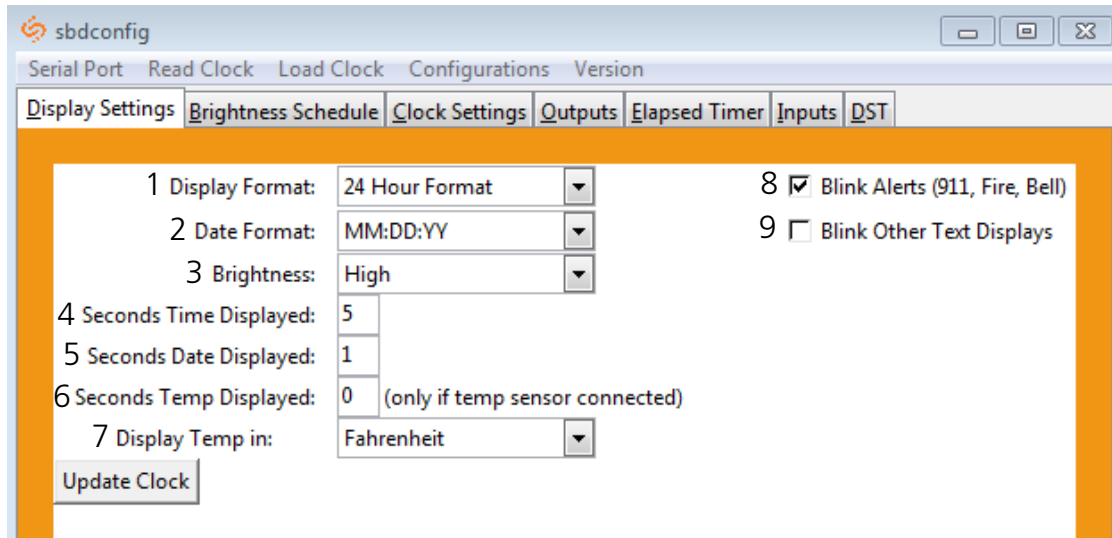
Clicking on the Display Settings tab will allow a user to program the following settings:

1. Display Format - Allows the user to select how the time is displayed on the clock. There are two options: 12 hour format (3:00AM/3:00PM) or 24 hour format (3:00/15:00).

2. Date Format - Sets the date to display in either American style: MM:DD:YY or European style: DD:MM:YY. For 4 digit clocks, the date will display in either American style: MM:DD or European style: DD:MM.

3. Brightness - Sets the brightness level that the clock will display. There are four levels to choose from: High, Medium, Low or Off.

4. Seconds Time Displayed* - The clock will display the time for the number of seconds entered in the box. After the selected amount of time passes, the clock will change to show Date or Temperature. If a time of 0 is selected, the clock will not display the time. If Date and Temp Displayed are set to 0, the clock will only display the time.

5. Seconds Date Displayed* - The clock will display the date for the number of seconds entered in the box. After the selected amount of time passes, the clock will change to show the Time or Temperature. If a time of 0 is selected, the clock will not display the date. If Time and Temp Displayed are set to 0, the clock will only display the date.

6. Seconds Temp Displayed* - If a temperature sensor was installed on the clock, the clock will display the temperature for the number of seconds entered in the box. After the selected amount of time passes, the clock will change to show the Time or Date. If a time of 0 is selected, the clock will not display the temperature. If Time and Date Displayed are set to 0, the clock will only display the temperature.

7. Display Temp In - If a temperature sensor was installed on the clock, this option allows a user to select whether the temperature appears in Fahrenheit or Celsius.

8. Blink Alerts (911, Fire, Bell) - When checked, this option will enable the emergency alert messages programmed with the master clock to blink when activated (see the specific master clock user manual for more information). Leaving the message unchecked will result in the message being sent in text that does not blink.

9. Blink Other Text Displays - When checked, this option will enable any other messages programmed with the master clock to blink when activated (see the specific master clock user manual for more information). Leaving the message unchecked will result in the message being sent in text that does not blink.

Once all of the Display Settings are chosen, click the 'Update Clock' button to store the selected options or, when all the tabs have been programmed, click the 'Load Clock' button located on the menu bar to store all options.

Note: If the Time, Date, and Temp Displayed are ALL set to 0, the display will turn completely blank. Will turn on for count down/up, and off again once the counting has been cleared.

sbdconfig - Brightness Schedule
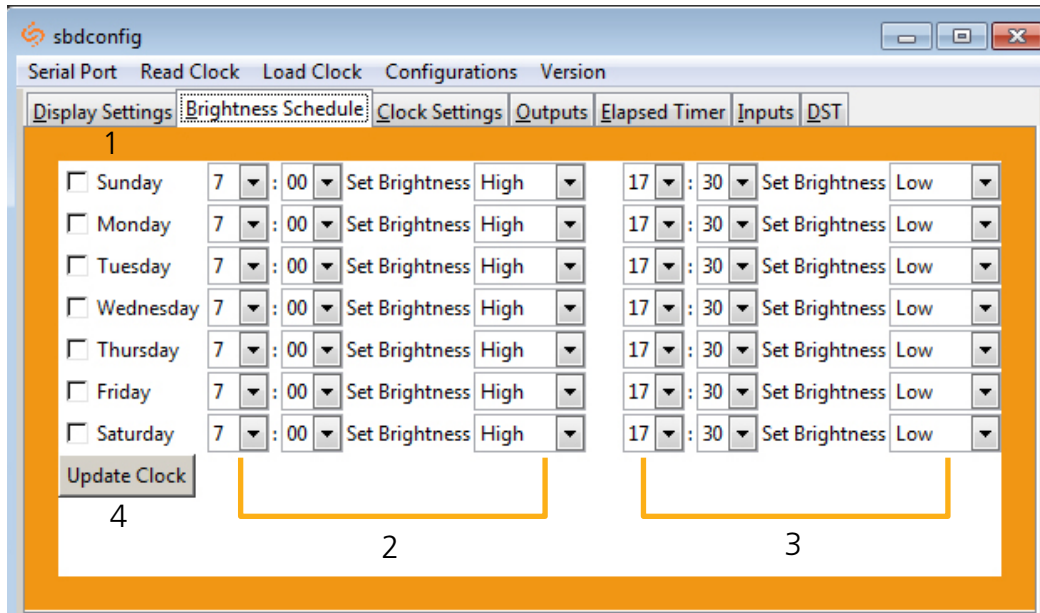
1. Clicking on the Brightness Schedule tab allows a user to establish a Brightness Schedule for the digital clock(s).

2. Date Column - Allows the user to select dates where changes to the brightness schedule are active. If a date is not selected, the actions in the adjustment columns will not be applied to the clock.

3. Adjustment 1 - Allows the user to select a new brightness level for the clock, and the time when the new brightness level will take effect. Times are entered in 24 hour mode. Brightness options are High, Medium, Low, and Off.

   Adjustment 2 - Allows the user to set a second time during a given day where the brightness level will change.

   The time for Adjustment 2 may be set for any time before or after Adjustment 1 during the same day. For example, if Adjustment 1 is set to activate at 11:00 AM and Adjustment 2 is set to activate at 8:00 AM, Adjustment 2 will activate first at 8 AM, followed by Adjustment 1 at 11 AM.

   If you wish for the brightness to only change once on a given day, set Adjustment 1 and Adjustment 2 to the same brightness level and time.

4. Once the Brightness Schedule has been programmed, click the 'Update Clock' button to store the selected options or, when all the tabs have been programmed, click the 'Load Clock' button located on the menu bar to store all options.

sbdconfig - Clock Settings
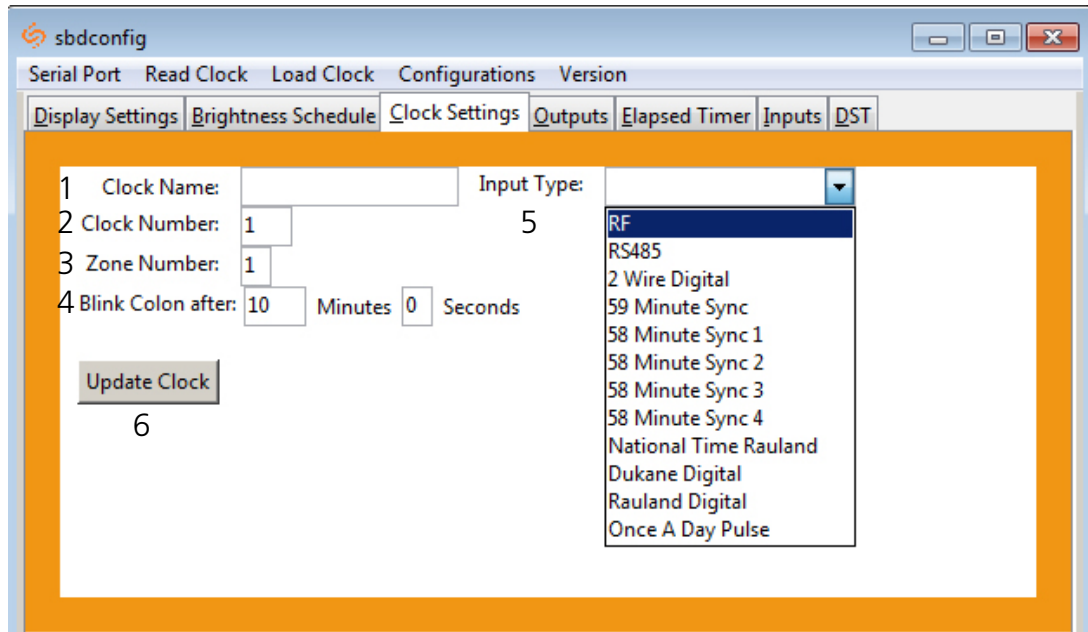
Clicking on the Clock Settings tab will allow a user to program the following settings:

1. Clock Name - This field allows a user to assign the clock a unique name, such as its location in a facility. The name cannot exceed 24 characters.

2. Clock Number - This field allows a user to assign a unique number to a clock. This number is used when commanding a specific digital clock from the Master Clock Web Interface. Please refer to the master clock manual associated with your system for more information.

3. Zone - This field allows a user to enter a number (1-99) for the clock's zone. A zone is a collection or grouping of clocks within a certain section of a facility. This number is used when commanding a designated group of digital clocks from the master Clock Web Interface. Please refer to the master clock manual associated with your system for more information.

4. Blink Colon After - The colon on the digital clock display has the ability to blink in order to signify a loss of communication with the master clock. These fields will let the user choose how long after a loss of communication the clock will wait before the colon starts to blink.

5. Input Type - Selecting an item from this drop-down menu allows the user to select a primary input source for accepting new time data.

6. Once all of the Clock Settings are chosen, click the 'Update Clock' button to store the selected options or, when all the tabs have been programmed, click the 'Load Clock' button located on the menu bar to store all options.
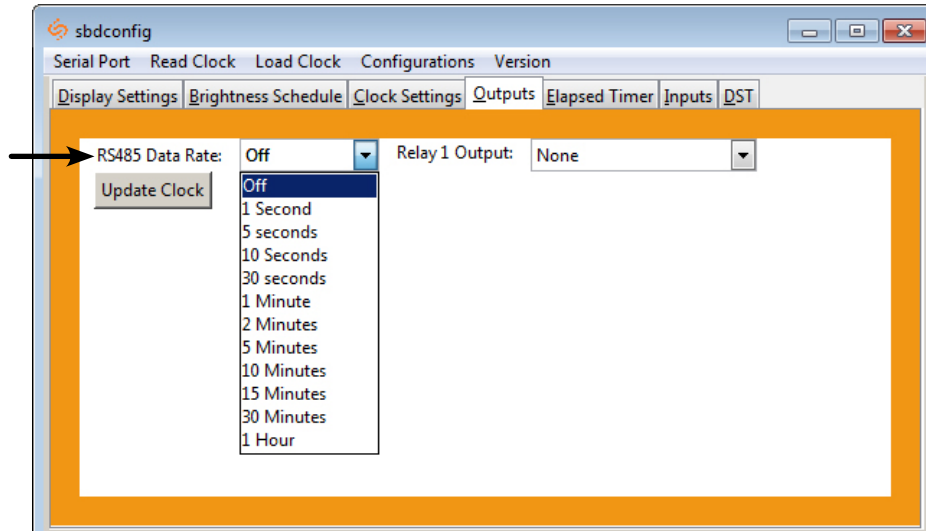
sbdconfig - Outputs

Clicking on the Outputs tab will allow a user to program the following settings:

RS485 Data Rate: This option determines how often data (time and date) is sent to the clock(s) or other Sapling devices, such as Wireless Repeaters, Converter Boxes, or other Master Clocks.

Relay 1 Output: This option allows a user to choose the time sync the clock uses to correct other time keeping devices, such as paging systems, an existing master clock, or other devices manufactured by different companies. Refer to "Output-Relays" for wiring information and "Manual Controls" setting 20 for an explanation of each output type.

Once the Relay 1 Output settings are chosen, click the 'Update Clock' button to store the selected options or, when all the tabs have been programmed, click the 'Load Clock' button located on the menu bar to store all options.
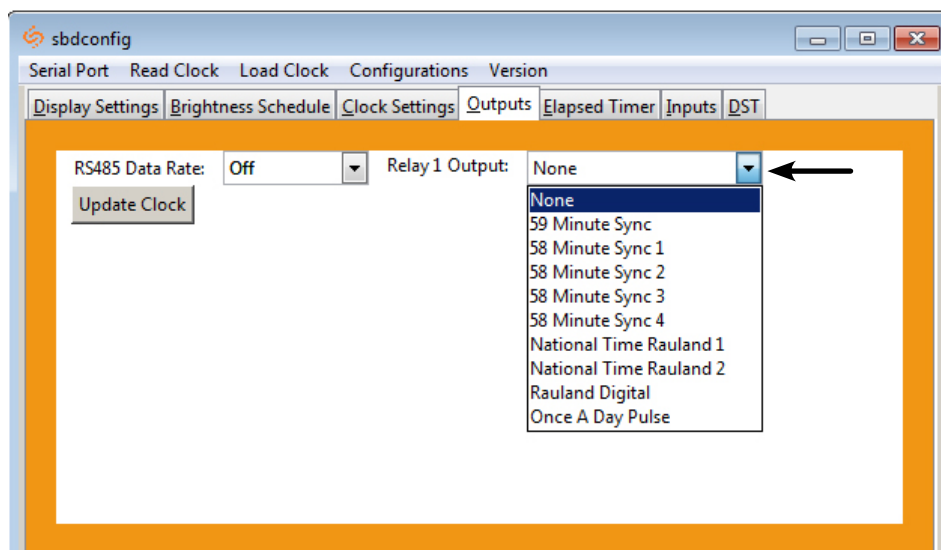
sbdconfig - Elapsed Timer

A user may set up and configure the Elapsed Timer control panel through sbdconfig. For detailed instructions, on the many functions and uses of the Elapsed Timer, refer to the Elapsed Timer Manual.
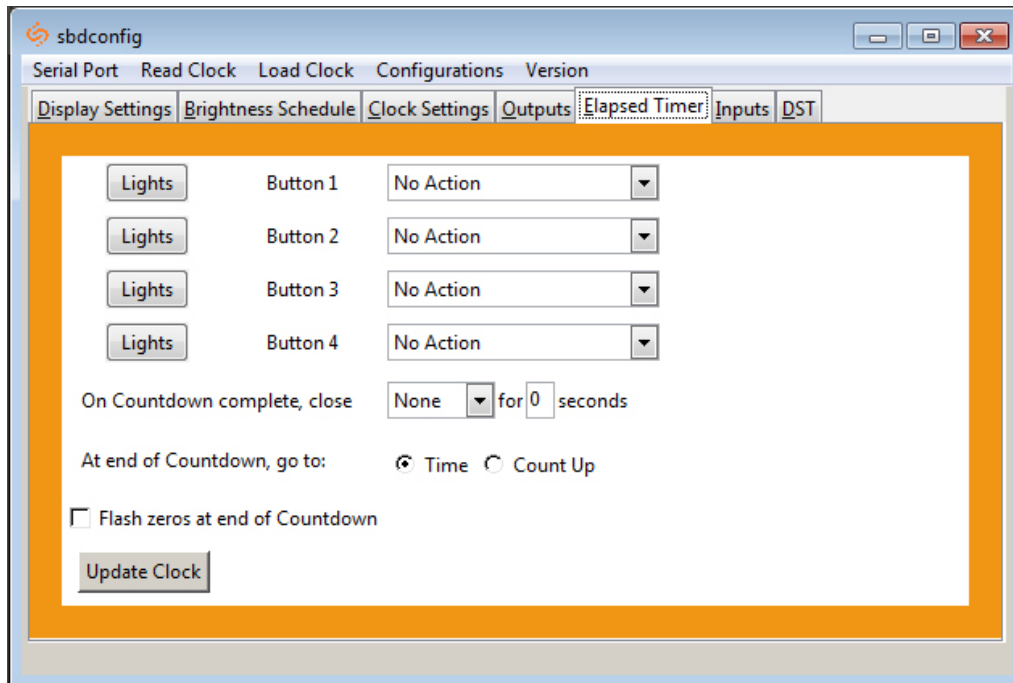
sbdconfig - Inputs
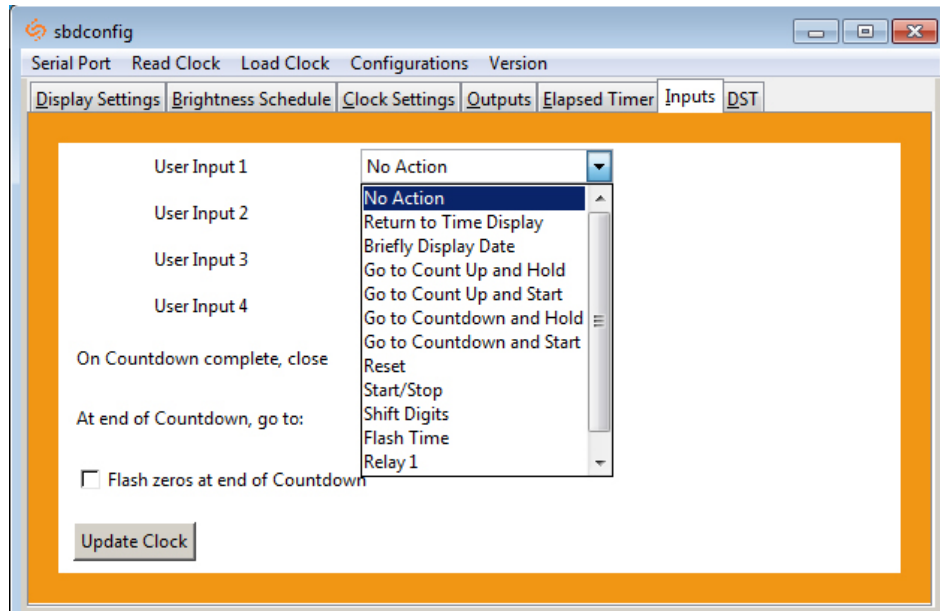
The 'Inputs' tab allows a user to program the clock to perform a certain function through a switch or relay contact closure from an outside device such as Code Blue, Nurses Call, etc. Program the first Input on the SBD 3300 by selecting one of the options in the drop down list next to Input 1. Listed below are the options and the function of each one:

No Action - This function does nothing if the input is activated.

Return to Time Display - Activating the input causes the clock to display the time. If a countdown or count up is in progress, the function is reset when the input is activated.

Briefly Display Date - Activating the input causes the clock to briefly display the date. This only works if the clock is displaying the time, not a countdown.

Go to Count Up and Hold - Activating the input causes the clock to display and hold at zero.

Go to Count Up and Start - Activating the input causes the clock to switch from its current display and begin a count up from zero.

Go to Count Down and Hold - Activating the input causes the clock to display and hold at a start time specified by the user.

Go to Count Down and Start - Activating the input causes the clock display to begin counting down from a time specified by the user.

Reset - Activating the input restarts whichever countdown/count up is in progress.

Start/Stop - Activating the input causes the timer to pause or resume its counting functions.

Shift Digits - Activating the input causes the digits to shift from displaying Hour/Minutes to Minutes/Seconds (Applies to 4 digit clocks only).

Flash Time - Activating the input causes the clock to briefly display the time while another function, such as count up or count down, is occurring. Activating the input does not pause, stop, or reset whichever function is occurring at the same time.

Relay 1 - Activating the input causes Output Relay 1 to activate.

Relay 2 - Activating the input causes Output Relay 2 to activate.

Code Blue - Performs a special-purpose count up. Refer to the section on the next page labeled "Code Blue"

sbdconfig - Inputs (ctd.)

Code Blue:

Code Blue is a special-purpose count up designed for use in hospitals and other medical facilities. This function overrides the control panel LED settings. The lights are green while the timer is running and red when the timer has been paused.
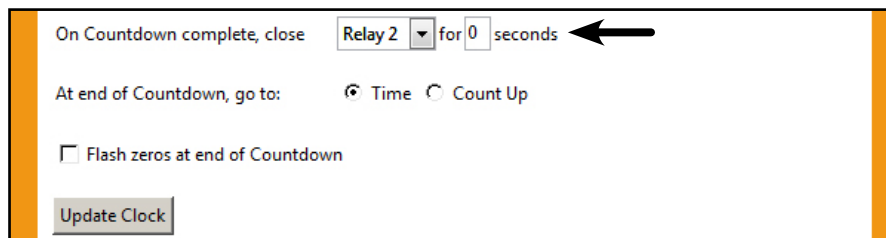
When an input programmed with Code Blue is activated for the first time, the count up starts.

When the input is activated a second time, the count up pauses. If the input is activated a third time, the count up will resume.

When the input is activated for a period longer than three seconds, the count up resets to zero and the display goes back to showing the time.

If a button programmed with the Start/Stop function is pressed while Code Blue is running, the count up will pause. If Start/Stop is pressed again, the count up will resume.

On countdown complete, close: This option allows a user to choose how many seconds a relay will be closed for.
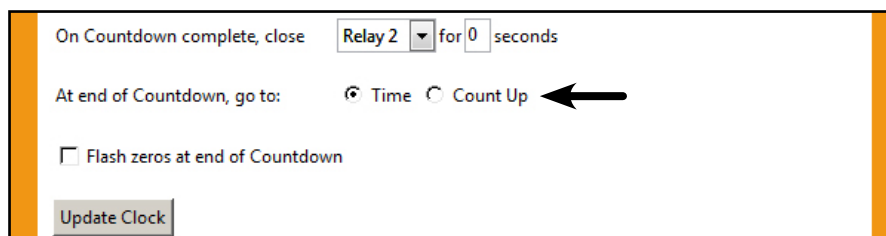
At end of Countdown, go to: This option allows a user to choose between having the clock display the time or start a count up when a countdown completes.

Once all of the Input settings are chosen, click the 'Update Clock' button to store the selected options or, when all the tabs have been programmed, click the 'Load Clock' button located on the menu bar to store all options.

sbdconfig - Daylight Saving Time (DST)

The DST Tab allows a user to configure the clock for automatic Daylight Saving Time changes.

Select Method for Defining DST: This drop down allows a user to choose between four options for Daylight Savings Time.

Day of Month: When this option is selected, Daylight Saving Time can be set based on what date and time it begins and ends. For example, Daylight Saving Time can begin on March 28 at 2AM and end on November 1st at 2AM. (Fig. 1.)

Fig. 1

Day of Week in Month: When this option is selected, Daylight Saving Time can be set based on what week in what month and what time it begins and ends. For example, Daylight Saving Time can begin on the second Sunday in March at 2AM and ends on the first Sunday in November at 2AM. (Fig. 2)

Fig. 2

By Country: When this option is selected, Daylight Saving Time can be chosen by country. For example, Daylight Saving Time can be selected to follow the DST rules established in the United States. (Fig. 3)

Fig. 3
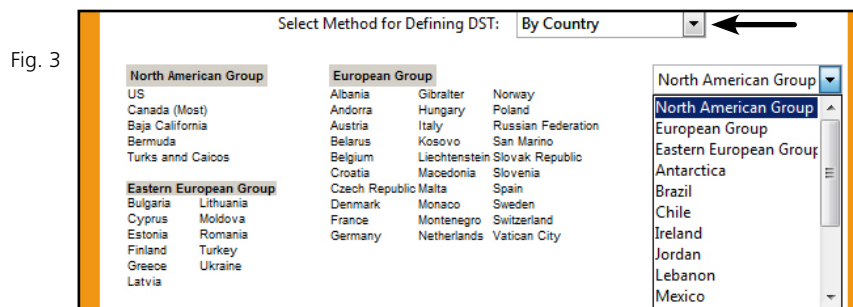
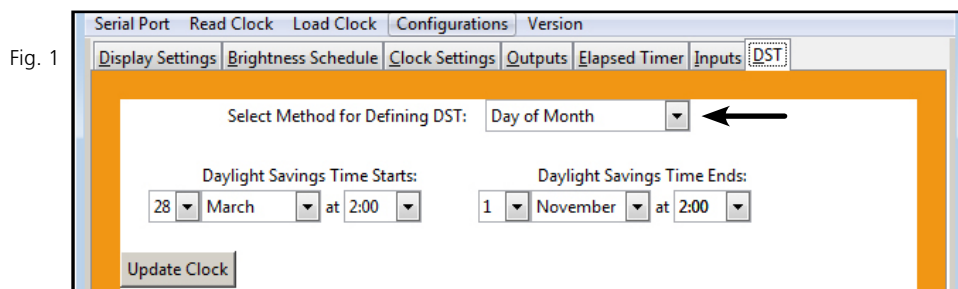**None:** When this option is selected, Daylight Saving Time is not applied. (Fig. 4)

Fig. 4
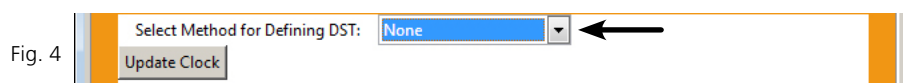
Once all of the DST settings are chosen, click the 'Update Clock' button to store the selected options or, when all the tabs have been programmed, click the 'Load Clock' button located on the menu bar to store all options.
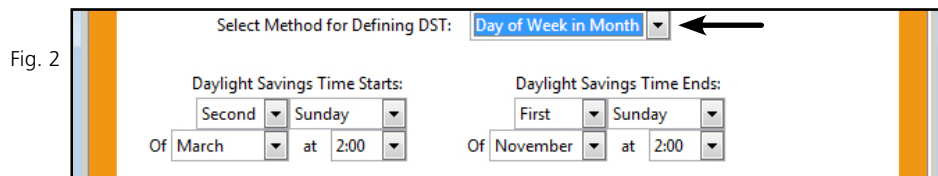
Reading the Display

The digital clock is designed to display time in either a 12-hour or 24-hour format. When the display is set to the 12-hour format, a circular light will appear in the top left corner of the display to indicate PM, or disappear to indicate AM. When the display is set to the 24 hour format, the full 24-hour time will appear on the display; no other lights should appear.

Some examples:

5:30 AM (12-hour format)

5:30 PM (12-hour format)

5:30 AM (24-hour format)

5:30 PM (24-hour format)

The factory default setting for all digital clocks is the 12-hour format. If you wish to set the clock to display time in a 24-hour format, see the section labeled "Jumper Settings" or "sbdconfig - Display Settings", included earlier in this manual.

Frequently Asked Questions

Can this digital clock be used as a standalone clock?

The SBD 3300 can be used as a standalone clock, but it will not keep synchronized time in this configuration. Instead, it will rely on an internal quartz oscillator for keeping the time. The clock will drift by a few seconds each year while in this mode, and will need to be readjusted manually.

How can I use this digital clock with Rauland, Dukane and other systems?

3300 clocks can be added directly to several sync wire systems. Refer to the Inputs section of this manual for instructions on how to connect the clock to each system type.

3200 and 3100 clocks can obtain time from these systems through a master clock working as a translator. Data from the other system would be sent to the master clock, and then the master clock would send the data to the digital clocks through 2-wire, RS485, or wireless communication protocols.

What happens to the digital clock if a power failure occurs?

If a power failure occurs, the display will shut off but the clock will continue to keep time with its internal quartz oscillator. This oscillator will continue to run on a tiny battery backup for about ten years. In this mode, it may drift from synchronized time by a few seconds for each year that the clock is without power. Once power is restored to the clock, the display will turn on and display the time on the quartz oscillator. It will correct this to accurate, synchronized time once a signal from a master clock is received.

What happens to the digital clock if contact with the time data source is lost?

The digital clock will rely on an internal quartz oscillator for keeping the time until time data is received. The clock will drift by a few seconds each year while in this mode, and will need to be readjusted manually.

The 3300 digital clock is able to act as a master clock. If the communication input is lost to the 3300, and the 3300 is acting as a master, then the clock will send synchronization data to any clocks down the line that are connected. This data will be based off of the 3300's quartz oscillator, so while the clocks will be synchronized to each other, they may not be showing accurate time.

How do I take advantage of the 3200/3300 chronograph functions?

The Chronograph functions can be engaged through Sapling's Elapsed Timer (part# SBD-ELT-001-0), or by using a dry contact closure with the configurable user inputs (3300 only). Refer to the respective selections of this manual for setup instructions.

How can I display "BELL" and "FirE" on the clock?

"FirE" and "BELL" are signals sent by the appropriate master clock. Refer to the master clock manual for instructions.

For 24V clocks, what happens if voltage on the power line drops from 24VAC to lower voltage?

The clock will still function, and will maintain the same level of brightness. However, the current consumption will increase proportionally to the decrease in voltage.

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Troubleshooting

The clock is not running. What do I do?

1. Measure the input voltage to the clock. The voltage should measure 85-135 volts in the 120VAC model or 240VAC model or 10-28 volts in the 2.5"/24VAC model and 16-28 volt in the 4.0"/24VAC model.

2. Make sure the transformer is an isolated transformer if using a 24VAC model.

3. Make sure the ground wire is not touching other wires.

NOTE: If you fail to follow instructions 2 and 3 listed above, the fuses can be blown.

The clock is not receiving an input signal. What do I do?

1. Make sure that the RS485 is connected properly when using in RS485 secondary mode. Make sure that JP6 is in the proper position. Refer to "Adjustable Jumper Settings" for details and diagrams.

2. Make sure that the polarity of the communication wire is correct when using the clock in 2-wire digital communication slave mode. Make sure that JP6 is in the proper position.

3. If interfacing with other systems, make sure that the input voltage is zero when not applying a correction signal. When taking this measurement, you must be sure that the clock is disconnected from the master clock. Also, measure both AC & DC voltage. (The current consumption needed is very low, about 3mA, and a leakage current from the master clock can be interpreted as a continuous reset signal. If you are experiencing such a problem, please install a bypass mechanical relay).

There is data noise bleeding into the intercom line. What do I do?

Increase the RS485 transmission rate from the master clock to once a minute.

My version of the sbdconfig.exe software is not working with my clocks. What should I do?

3200/3300 clocks shipped before March 27, 2014 require an older version of the sbdconfig software, while SBD 3200/3300 clocks shipped after March 27, 2014 require a newer version of the sbdconfig software. If your clock does not respond to your version of sbdconfig, you may request both versions of the program by contacting support at +1 (215)-322-6063.

Warranty

Sapling Limited Warranty and Disclaimer

The Sapling Company, Inc. warrants only that at the time of delivery and for a period of 24 calendar months after delivery or the period stated in this invoice, if different, the Goods shall be free of defects in workmanship and materials, PROVIDED that this warranty shall not apply:

To damage caused by Buyer's or any third party's act, default or misuse of the Goods or by failure to follow any instructions supplied with the Goods.

Where the Goods have been used in connection with or incorporated into equipment or materials the specification of which has not been approved in writing by The Sapling Company, Inc.;

To Goods which are altered, modified or repaired in any place other than a Sapling Company, Inc. factory or by persons not expressly authorized or approved in writing by The Sapling Company, Inc.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WITH RESPECT TO GOODS DELIVERED UNDER THIS CONTRACT, WHETHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The foregoing warranty runs only to Buyer. There are no oral or written promises, representations or warranties collateral to or affecting this contract. Representatives of The Sapling Company, Inc. may have made oral statements about products described in this contract. Such statements do not constitute warranties, shall not be relied on by Buyer and are not part of the contract.

Note: An extended 5 year (60 month) warranty is also available at the time of the system purchase with a surcharge.