

BRG Mega Digital Clock



Installation and Operation Manual

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Operation

The BRG Mega clock is based on super bright LED technology coupled with a very capable microprocessor. The Mega microprocessor is able to store the user's configuration in duplicate. If the configuration becomes corrupt by someone configuring the display incorrectly, the original customer configuration can be instantly restored. The Real Time Clock includes a temperature compensated quartz crystal as the standard time base and is accurate to a few seconds per year. For absolute accuracy, several time receiver options are available including, Ethernet employing Network Time Protocol, BRG Wireless radio receiver, PC serial interface, IRIG-B, and SMPTE receivers.

Real Time Operation –

The Mega Real Time Clock employs a clock circuit with battery backup. The clock circuit will maintain time for about ten years without power. When you receive your new clock and apply power, you will see the clock already running. To correct the time, simply press and hold either the Up or Down buttons. The time will increment or decrement faster and faster as the buttons are held.

Mega Clock Processor Configuration Menu

Processor Type

Two types of processors are typically used in BRG digital clocks, Tiger and Mega. The Tiger processor is usually found in timers, counters, and more complex display configurations. The Mega processor is used where other features are needed that are not available in the Tiger processor, or displays not requiring features found in the Tiger processor. The Mega processor is available in general clock as well as special timer configurations. The factory will install the processor type most appropriate for the customer's requirements. The menu will indicate the type of processor used. Once in the menu system, if the Mega processor uses leading zeros and the Tiger processor does not. If the Mega is configured as specialized timer, then some of the clock functions will not be available. If Mode 10 does not display a value when access is attempted through the menu, then the Mega is configured as a specialized timer.

When the Mega is displaying real time, simply press the Up button to advance the time, or the Down button to decrement the time. The longer the buttons are held down, the faster the time will change. Press the Mode button to enter modes listed below.

First Menu Level Mode Number	Value Range	Mode Description and Instructions
<u>Menu Selection</u>	Operating Value.	<ol style="list-style-type: none"> 1- Press and hold the Mode button for 3-4 seconds, or until 01 appears on the display. If the customer's configuration was previously saved to secondary memory, all segments on all displays will illuminate while the mode button is held down. 2- Once in the menu system, use the Up and Down buttons to move to the desired parameter address. 3- Once at desired parameter address, press the Mode button once to display the parameter value. 4- Use the Up and Down buttons to change the parameter value. 5- Press the Mode button to return to the parameter address or press the Timer Control button to save any changes and exit the menu system. 6- To exit the menu system, press the Timer Control button, or use the Down button and move to parameter address 00. The clock will return to normal display mode.
0. Change Time	00:00 to 23:59 or 12:00 AM to 12:00 PM	Simply press the Up button to advance the time, or the Down button to decrement the time. The longer the buttons are held down, the faster the time will change. Press the Mode button to enter modes listed below.

First Menu Level Mode Number	Value Range	Mode Description and Instructions
1.	01 to 31	<p><u>Day of the Month</u> Pressing the Up button advances the days, pressing the Down button decrements the days. Be sure to use valid day for any specific month. For example, do not enter a day of 30 for the month of February.</p>
2.	01 to 12	<p><u>Month</u> Pressing the Up button advances the month, pressing the Down button decrements the month.</p>
3.	00 to 50	<p><u>Year</u> Pressing the Up button advances the year, pressing the Down button decrements the year.</p>
4.	0-4	<p><u>Blinking Colon</u> To enable the blinking colon, first disable Follow Master Clock by setting Mode 6 to 00, then set Mode 4 to 01 to enable the blinking colon. If the clock is connected to a master clock using sync wire, the master clock may be configured to control the blinking colon of all secondary clocks. See also Mode 5 and Mode 41.</p> <p>0=solid colon with no leading zero, 1=blinking colon with no leading zero 2=no colon with no leading zero 3=no colon with leading zero (display modes 2, 5, 17) 4=solid colon with leading zero (display modes 2, 5, 17) 5=disable blinking sync indicator 6=Blink colon if serial sync (Ethernet, PC, Wireless) is lost more than one hour. 7=Blink colon if serial sync (Instaset) is received within one hour.</p>
5.	0,1	<p><u>12/24 Hour Display Format</u> 0=12 hour display format (default), 1=24 hour display format</p>
6.	0-6	<p><u>Sync Format</u> Select from various optional sync methods.</p> <p><u>0= Synchronous three wire circuit (default) –</u> This mode was formerly assigned to value 2 in firmware versions prior to version 4.2. When a voltage is applied to the control line for 8 seconds, the hours will remain unchanged, the minutes will set to 58 and the seconds will set to 02. When a voltage is applied to the control line for 14 seconds, the hours will be set to 5 am or 5 pm (depending on which the current time is closest to), the minutes set to 58 and the seconds set to 08.</p> <p>American: A4015D10 ATS: CC2000 Series digital clocks Cincinnati: D10 and D12 Dukane: 24SS Series Edwards: 010 IBM: 57, 62, 67, 77, 82 and 87 Series</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
7.	-15-15	<p>Lathem: SS12 Series Simplex: 2310-92xx, 57 and 77 Series Stromberg: 3000</p> <p><u>0=RS422</u> – (default) Serial Wire Sync See also Mode 4=6 and Mode 4=7</p> <p><u>When Mode 17 does not equal zero, down timer commands from a wireless master clock are ignored.</u></p> <p><u>0=Ethernet</u> – (default) Ethernet UPD or NTP synchronization See also Mode 4=6 and Mode 4=7</p> <p><u>900 MHz Digital Radio Control</u> 1= receive 2= transmit (also set Mode 13=1 to enable transmit mode) 3= repeater mode (Mode 13 is set automatically) – not recommended for use with analog clocks. This mode only transmits when a time transmission is received. 7= repeater mode only when the hour = 2 (version 6.6 or later) – recommended for use with analog clocks. During repeater period, the clock only transmits if a time transmission is received. All other hours, the clock transmits continuously once per second. <u>See also Mode 12, Mode 13 and Mode 42</u></p> <p><u>6=Run timer continuously</u> – (Optional - only available on the Mega Timer) This mode is typically used when display hours or days only. The timer starting value can be changed using the Timer Control button.</p> <p><u>Display Intensity</u> 1=minimum intensity, 15=maximum intensity (default), 0=enable auto-brightness (if installed) -1 to -15 alters the effect of auto-brightness (if installed),</p>
8.		<p><u>Adjust Time Received for Daylight Saving Time</u> 0=disabled 1=enabled (default) Removes daylight saving time from serial time data received. By default, the clock expects to receive local serial time updates. If daylight saving time is active, then the time received will be decremented one hour. The hour will be restored when the time is displayed. If daylight saving time is not active, the time will be displayed as it is received, in addition to any time zone offsets.</p>
9.		<p><u>Wireless Countdown Timer Configuration</u> 0=disabled 1 (default) - 9 = clock countdown timer address</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
10.	0,1,2,3,	<p><u>Requires BRG1751v3 or later UHF decoder/receiver</u></p> <p>This feature is not available in the default software build.</p> <p>This mode is used to configure wireless countdown timers. The master clock can send a command to countdown from 1 to 9 minutes.</p> <p><u>Temperature Calibration</u> 0=disabled (default) 10=enabled – This mode is used when calibrating temperature sensors. It will display the Fahrenheit temperature in tenths of a degree. The display will return to normal temperature display mode when the power to the clock is cycled.</p> <p><u>Daylight Savings Time Automatic Switching</u> (unavailable on the Mega Timers)</p> <p>This mode has been discontinued beginning with Version 7.4. See Modes 50 and 51 for rule based switching between Daylight and Standard time.</p> <p>0 = disabled 1 = old U.S. daylight saving time (disabled in ver. 5.9 and later) 2 = UK daylight saving time, 3 = US daylight saving time rule (default),</p> <p>When this feature is enabled, the time will automatically switch between standard and daylight saving time.</p>
11.	-12 to +13	<p><u>Time Zone Offset</u> (unavailable on the Mega Timers)</p> <p>-12 to 13, 0=default</p> <p>This feature allows adjusting time received from an external source to the local time. Mode 53 allows an additional positive offset from 0-60 minutes.</p>
12.		<p><u>900 MHz Digital Radio Channel Selection</u></p> <p>This mode determines the radio channel to be used. (ver. 5.1 or later)</p> <p>20 = (default) U.S. / Canada - radio channel - scan all channels in receive mode</p> <p>Channels 16-55 should be used in repeater mode, and optionally for receive and transmit modes. 16-47 - U.S. / Canada - radio channel - scan all channels in receive mode 48-55 - Australia / New Zealand - radio channel - scan all channels in receive mode</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
		<p>Channels 56-95 can be used in receive or transmit modes. 56-87 – U.S. / Canada - no channel scanning– includes +40 offset 88-95 - Australia / New Zealand – no channel scanning– includes +40 offset</p> <p>Transmit and Repeat mode always uses fixed channel assignments.</p> <p>900 MHz Repeaters</p> <p>Beginning with version 6.8, when the clock is configured as a repeater (Mode 6=3), it will wait to receive a time transmission before transmitting the time. When time data is received, the clock switches from receive mode to transmit mode, waits 2 seconds, then sends time packets every second for the next 8 seconds. It then switches back to receive mode and awaits another time transmission.</p> <p>By default, repeaters use both odd and even channels; therefore, it is recommended to configure Mode 12 to use only even channel numbers in case multiple repeaters are deployed. The repeater will receive on the channel specified in Mode 12 and transmit on the next higher channel. For Mega version 5.5 and later, Mode 43 may be used to configure a repeater transmit channel other than the receive channel plus one. The default is 1. If Mode 43 is a value other than one, then it is used as the repeater transmit channel. For example, if Mode 12 = 47 and Mode 43=16, then the repeater would receive on channel 47 and transmit on channel 16.</p> <p>Mode 13 is automatically set when configured as a repeater.</p> <p>Channels 16-55 should be used in repeater mode.</p> <p>Example 900 MHz system with master clock, repeaters, and slave analog and digital clocks:</p> <p><u>Tiger Master Clock Configuration</u> Configure master clock to transmit once per second on channel 48</p> <p><u>Repeater Number 1</u> Mode 4=6 – enable blinking colon sync detector Mode 6=3 – enable repeater mode Mode 10=0 – disable daylight saving time Mode 12=48 – repeater receive channel, will transmit on channel 49 Mode 42=1 – group number for Australia Mode 44=0 – disable cyclic redundancy for time packet reception Mode 45=100 – (default) reduce propagation delay between repeaters</p> <p><u>Repeater Number 2</u> Mode 4=6 – enable blinking colon sync detector Mode 6=3 – enable repeater mode Mode 10=0 – disable daylight saving time Mode 12=49 – repeater receive channel, will transmit on channel 50 Mode 42=1 – group number for Australia Mode 44=0 – disable cyclic redundancy for time packet reception Mode 45=100 – (default) reduce propagation delay between repeaters</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
13.		<p><u>Repeater Number 3</u> Mode 4=6 – enable blinking colon sync detector Mode 6=3 – enable repeater mode Mode 10=0 – disable daylight saving time Mode 12=50 – repeater receive channel, will transmit on channel 51 Mode 42=1 – group number for Australia Mode 44=0 – disable cyclic redundancy for time packet reception Mode 45=100 – (default) reduce propagation delay between repeaters</p> <p><u>All Mega Slave Clocks</u> Mode 4=6 – enable blinking colon sync detector Mode 6=1 – enable repeater mode Mode 10=0 – disable daylight saving time Mode 12=48 – will scan all channels in receive mode Mode 42=1 – group number for Australia Mode 44=0 – disable cyclic redundancy for time packet reception Mode 45=100 – (default) reduce propagation delay between repeaters</p> <p><u>All Analog Slave Clocks</u> Configure to scan all channels in receive mode Configure as group 1 for Australia</p> <p><u>Setting this mode to a channel less than 56 will cause the radio to scan all available channels while in receive mode (Mode 6=1).</u></p> <p><u>See also Mode 6, Mode 13, Mode 42, Mode 44 and Mode 45</u></p> <p><u>Serial Transmit</u> 0=disabled (default) 1=enabled <u>See also Mode 6, Mode 12 and Mode 42</u></p>
14.	1-3	<p><u>Display Operating Mode</u> 1=real time clock (default), 2=Up timer, short or long duration – (Optional) 3=Down timer, short or long duration – (Optional)</p> <p>Real Time Adjustment – Press the up or down buttons to change the hours and minutes. The seconds will set to zero when changing the time. Holding the buttons down will cause the value to change faster.</p> <p>Optional Timer Value Adjustment - Momentarily press the Timer Control button. The first display will be at half brightness, all other displays will blank out. If only one display is used, it will go to half brightness. Press the up and down buttons to adjust the value. Holding the buttons down will cause the value to change faster and faster. Momentarily press the Timer Control button again to move to the next display. When the last display is adjusted, press the Timer Control button again to return to</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
15.		<p>normal operation. All displays will return to the same brightness. Set Mode 6 = 6 to run the timer continuously. The Start/Stop/Reset buttons are disabled in the continuous run mode.</p> <p>If power is lost, the display will blank out, but the timer will hold the last time. When power is restored, the last time will be displayed. The timer may need to be adjusted if the power was out for an extended time.</p> <p>Optional Timer Button Operation (disabled if Mode 6=6)-</p> <p><u>When the timer is stopped</u> –</p> <ol style="list-style-type: none"> 1. Pressing the Start button will start the timer running. 2. Pressing the Reset button will reset the values to 0. <p>The right decimal point will light when the timer is stopped.</p> <p><u>When the timer is running</u> –</p> <ol style="list-style-type: none"> 1. Pressing the Start button will pause the timer. 2. Pressing the Stop button will pause the timer. 3. If the timer is configured to continuously run (Mode 6=6), then pressing the Stop button will reset the time back to the starting value and continue running from that point. <p>The right decimal point is off when the timer is running.</p> <p><u>When the timer is paused</u> –</p> <ol style="list-style-type: none"> 1. Pressing the Start button will star the timer. 2. Pressing the Stop button will reset the values to 0. <p>The right decimal point will light when the timer is paused.</p> <p><u>Leading Zero on Selected Display Modes</u> 0=disabled, 1=enabled</p> <p>When enabled, leading zeros will appear on display modes 2, 5, and 17.</p>
16.	-999-999	<p><u>Temperature Adjustment – Channel 1</u></p> <p>0=default</p> <p>This value is used to adjustment the temperature reading up or down in tenths of a degree Centigrade.</p>
17.	-999-999	<p><u>Temperature Adjustment – Channel 2</u></p> <p>0=default</p> <p>This value is used to adjustment the temperature reading up or down in tenths of a degree Centigrade.</p> <p><u>When Mode 17 does not equal zero, down timer commands from a wireless master clock are ignored.</u></p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
18.	1-4	<p><u>Number of Four Digit Displays Installed</u> 1-4, 2=default,</p> <p>This value determines how many four digit displays are installed. Double and four sided displays may use a value of 1 to set all four sides to the same display. Other combinations are possible.</p>
19.	N/A	<p><u>Displays the software version number of the clock.</u></p>
20.	1-99	<p><u>Sets various display modes for the first display</u> The following modes are available:</p> <p>1 - ssxx – seconds left justified 2 - hh:mm – hours and minutes (default) 4 - nnnn – four digit year 5 - mm/dd – month and day 9 - xxxx – blank display 12 - mm:ss – minutes and seconds 13 - xssx – seconds centered 17 - dd/mm – international date format – day/month 20 - hh:mm – hours and decimal minutes 21 - nnnn – timer days (-9999 – 9999) – (Optional) 22 - nnnn – timer hours (-9999 – 9999) – (Optional)</p> <p>24 - nnoF – degrees Fahrenheit – Channel 1 25 - nnoC – degrees Centigrade – Channel 1 26 - nnoF – degrees Fahrenheit – Channel 2 27 - nnoC – degrees Centigrade – Channel 2</p>
21.	1-99	<p><u>Sets various display modes for the second display.</u> See Mode 20 for available display modes. The default display format is 13.</p>
22.	1-99	<p><u>Sets various display modes for the third display.</u> See Mode 20 for available display modes. The default display format is 2.</p>
23.	1-99	<p><u>Sets various display modes for the fourth display.</u> See Mode 20 for available display modes. The default display format is 2.</p>
28.	0-99	<p><u>Rotating Display Delay for Cycle Position 1 (Ver. 2.0 or later required)</u> 4 = (default) Up to 3 display formats may be cycled or rotated. This mode setting determines the time in seconds each display format is displayed. See Modes 31 through 36 to assign the desired display formats. For example, to display hours and minutes on display 1 and a temperature alternating between degrees F and degrees C on display 2, using temperature sensor port 1, then set Modes 31=2, 32=2, 34=24 and 35=25.</p>
29.	0-99	<p><u>Rotating Display Delay for Cycle Position 2 (Ver. 2.0 or later required)</u></p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
		4 = (default) Up to 3 display formats may be cycled or rotated. This mode setting determines the time in seconds each display format is displayed. See Modes 31 through 36 to assign the desired display formats. For example, to display hours and minutes on display 1 and a temperature alternating between degrees F and degrees C on display 2, using temperature sensor port 1, then set Modes 31=2, 32=2, 34=24 and 35=25.
30.	0-99	<u>Rotating Display Delay for Cycle Position 3 (Ver. 2.0 or later required)</u> 4 = (default) Up to 3 display formats may be cycled or rotated. This mode setting determines the time in seconds each display format is displayed. See Modes 31 through 36 to assign the desired display formats. For example, to display hours and minutes on display 1 and a temperature alternating between degrees F and degrees C on display 2, using temperature sensor port 1, then set Modes 31=2, 32=2, 34=24 and 35=25.
31.	0-99	<u>Display Format – Display 1, Cycle Position 1</u> The display format will be displayed on display 1, in display cycle 1. See Mode 30 to adjust the time delay before switching display formats.
32.	0-99	<u>Display Format – Display 1, Cycle Position 2</u> The display format will be displayed on display 1, in display cycle 2. See Mode 30 to adjust the time delay before switching display formats.
33.	0-99	<u>Display Format – Display 1, Cycle Position 3</u> The display format will be displayed on display 1, in display cycle 3. See Mode 30 to adjust the time delay before switching display formats.
34.	0-99	<u>Display Format – Display 2, Cycle Position 1</u> The display format will be displayed on display 2, in display cycle 1. See Mode 30 to adjust the time delay before switching display formats.
35.	0-99	<u>Display Format – Display 2, Cycle Position 2</u> The display format will be displayed on display 2, in display cycle 2. See Mode 30 to adjust the time delay before switching display formats.
36.	0-99	<u>Display Format – Display 2, Cycle Position 3</u> The display format will be displayed on display 2, in display cycle 3. See Mode 30 to adjust the time delay before switching display formats.
40.	0,1	<u>Reverse Down Direction Timer at Zero</u> 0=disabled – timer stops at zero 1=enabled (default) – timer reverses at zero
41.	0,1,2	<u>Reverse Decimal Point</u> 0=normal decimal (default), 1=reverse the position of the decimal point for discrete digit displays. 2=add colon to display modes 1 and 2 for discrete displays 3=turn on decimal when sync received, reset at midnight 4=turn on decimal when sync lost, , reset at midnight 5=turn on decimal when sync received, reset hourly 6=turn on decimal when sync lost, reset hourly 7=blank display except for decimal when sync lost

First Menu Level Mode Number	Value Range	Mode Description and Instructions
42.	0-99	<p><u>Digital Radio Group Number</u> 0-99 (5=default)</p> <p>This mode allows changing the digital radio group number. The current group number will not display. The group number is changed immediately upon exiting this mode.</p> <p><u>See also Mode 6, Mode 12 and Mode 13</u></p>
43.	1-55	<p><u>Digital Radio Repeater Channel</u> 1-56 (1=default) U.S. Channel range = 16-47 Australia Channel range = 48-55</p> <p>For Mega version 5.5 or later, Mode 43 may be used to configure a repeater transmit channel other than the receive channel plus one. The default is 1. If Mode 43 is a value other than one, then it is used as the repeater transmit channel. For example, if Mode 12 = 47 and Mode 43=16, then the repeater would receive on channel 47 and transmit on channel 16.</p>
44.	0-2	<p><u>Serial Time Sync Cyclic Redundancy</u></p> <p>This mode has been discontinued beginning with Version 7.4</p> <p>0 = disabled 1 = compare two time receptions, UHF systems set time twice per hour (default) 2 = compare three time receptions, UHF systems set time once per hour</p> <p>This mode improves the reliability of time packets received by comparing 2 or 3 packets received. The hour, day, month and year must be equal in all packets compared before the packet will be used to set the time in the clock.</p>
45	0-250	<p><u>900 MHz Repeater Propagation Delay Cancellation</u> 100=default</p> <p>This mode is used to adjust and cancel out the propagation delay caused by using 900 MHz repeaters.</p>
46	0-9999	<p><u>Sync Source Timeout</u> 5=default</p> <p>Set the seconds delay before implementing the display action specified in Mode 41 when sync reception is lost.</p>
50	0-9999	<p><u>Automatic Switching Between Daylight Saving and Standard Time – Start DST</u> This mode is available in version 7.4 and later.</p> <p>Default=327 (Start DST the Second Sunday in March)</p> <p>Rule driven switching between Daylight Saving and Standard time uses a coded</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
51	0-9999	<p>value. The format is MMID, where MM = month (1-12), I = instance of the selected day of the week (1-5, 5=last instance), D = day of the week (1-7), where 1=Monday and 7=Sunday. For example, 327 represents the second Sunday in March, or 1117 represents the First Sunday in November. If the value >2000 then the right two digits represent the day of the month. The left two digits, minus 20, equal the month. For example, March 15th = 2315, April 1st = 2401.</p> <p>See also Modes 51, 52, and 53</p> <p><u>Automatic Switching Between Daylight Saving and Standard Time – End DST</u> This mode is available in version 7.4 and later.</p> <p>Default=1117 (End DST the first Sunday in November)</p> <p>Rule driven switching between Daylight Saving and Standard time uses a coded value. The format is MMID, where MM = month (1-12), I = instance of the selected day of the week (1-5, 5=last instance), D = day of the week (1-7), where 1=Monday and 7=Sunday. For example, 327 represents the second Sunday in March, or 1117 represents the First Sunday in November. If the value >2000 then the right two digits represent the day of the month. The left two digits, minus 20, equal the month. For example, March 15th = 2315, April 1st = 2401.</p>
52	0-12	<p>See also Modes 50, 52, and 53</p> <p><u>Hour to Switch Between Daylight Saving and Standard Time</u> This mode is available in version 7.4 and later.</p> <p>Default=2</p> <p>This mode determines the hour of the day to switch between Daylight Saving and Standard Time.</p>
53	0-60	<p>See also Modes 50, 51, and 53</p> <p><u>Forced Time Zone Offset in Minutes</u> This mode is available in version 7.4 and later.</p> <p>Default = 0</p> <p>This Mode Determines the number of minutes that will be added to the stored time before it is displayed. It can be used to implement special case time zone offsets. For example, to display time for St. Johns, Newfoundland which uses an offset of UTC minus 3:30 hours, set Mode 11 = -4 and Mode 53 = 30. A negative 4 hours plus a positive 30 minutes equals an offset of negative 3 hours and 30 minutes.</p>
81	0-3	<p>See also Mode 11</p> <p><u>Ultra-High Precision Oscillator Support</u> Oven Controlled (OCXO) and Rubidium (RbO) Oscillator Configuration</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
82	0,1	<p>0 (default) disable ultra-precision support, 1=calibrate the TCXO using the OCXO or RbO once per minute, 2=calibrate the TCXO using the OCXO or RbO once per hour, 3=calibrate the TCXO using the OCXO or RbO once per day Port 65 - OCX Reset Output Port 66 - OCX 1 BPS input</p> <p><u>Enable/Disable Up and Down Buttons</u> 0=enabled 1=disabled (default)</p> <p>This mode allows disabling the Up and Down buttons to prevent in a changing the time of a high accuracy (OCXO) synchronized clock.</p>
84	0-199	<p><u>Automatic Leap Second Adjustment</u> 0=disabled (default)</p> <p>The mode is used when a leap second will occur sometime in the future and external synchronization is not used. It is normally used with ultra-high precision oscillators such as oven controlled or Rubidium oscillators.</p> <p>A value of greater than 0 and less than 100 will add a leap second on June 30 at 23:59:59 UTC of the designated year.</p> <p>A value greater than 100 will add a leap second on December 31 at 23:59:59 UTC of the designated year (100+Year).</p> <p>A value of 99 will add a leap second on the current day at 23:59:59.</p> <p>During the change, at midnight, 0:00:00 displays for two seconds. When the leap second is added, Modes 32-84 will be reset to 0.</p>
91.	NA	
92.	NA	<p><u>Restore Factory Defaults</u> This command restores all factory default parameters and restarts the clock.</p>
93.	NA	<p><u>Restore User Defaults</u> This command restores the user parameter configuration previously stored using Mode 94. If no parameters were previously stored using Mode 94, then this command will have no effect.</p>
94.	NA	<p><u>Store user Parameters Into Secondary Memory</u> All configuration parameters are automatically stored into primary memory. This command stores the current clock configuration into secondary storage. If the primary clock configuration becomes unusable, the clock can be restored to the original user configuration using the command. This avoids the necessity to re-enter the user parameters again.</p>

First Menu Level Mode Number	Value Range	Mode Description and Instructions
95.	NA	<p>To save the current clock configuration into secondary memory, once Mode 94 appears on the display, press the Mode button once and release. Then press and hold the Mode button until all display segment illuminate, then release. The clock will return to normal display Mode once the parameters are restored.</p> <p>If user parameters have been previously saved to secondary memory, all segments will illuminate on the menu display when the entering the menu system. All segments will appear as long as the Mode button is pressed, when first entering the menu system.</p> <p><u>Illuminate All Display Segments</u> Pressing the Mode button momentarily will illuminate all display segments on all displays. Pressing the Mode button again will return to the menu.</p>
96.	NA	<p><u>Test Watchdog Timer</u> The Mega processor includes a hardware watchdog timer. If for any reason the clock becomes unstable for enters an endless program loop, the watchdog timer will automatically restart the clock. The watchdog timer operation may be tested by placing the clock into an endless program loop. Press the Mode button once to test the clock. Once the Mode button is release, the watchdog timer will reset the clock in two seconds and will return to normal display mode.</p>

Ethernet Communications Option

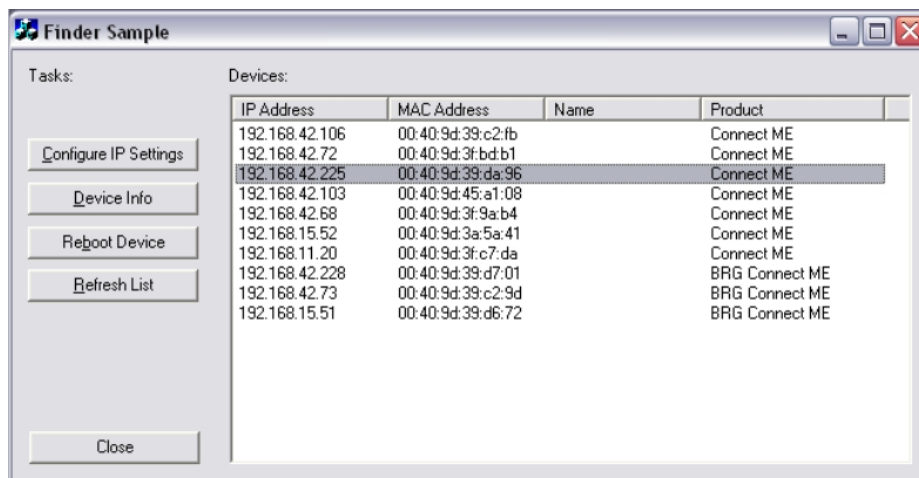
Overview

Once the clock is connected to the network and power is applied, DHCP is used to automatically assign each clock an IP address on the network. The clock will then search the Internet or local area network for NTP time servers. NTP (Network Time Protocol) is a uniform method of sending time over a computer network. By default, the clock will automatically connect to the local network and attempt to act as a client to public or local SNTP time servers. SNTP is a subset of the NTP protocol. SNTP provides Universal Coordinated Time (UTC) to the clock. The clock then implements local time zone offsets and daylight saving rules to display the correct local time. The correct time will display within a few minutes of obtaining a time server lock. The clock includes a list of 10 Internet SNTP time servers. Local SNTP time servers may also be used. The clock includes a network web server which is used to configure various network communication parameters.

Ethernet Interface

The Ethernet interface includes an easy to use web interface. Automatic address configuration (DHCP) is enabled by default. However, if a fixed network address will be used instead of DHCP, then the interface configuration will need to be changed.

To configure the Ethernet interface, it must first be located on the network. The Clock Control program is used to discover clock(s) located on the same subnet as the PC. Alternatively, a program is available (finder.exe) that will locate the clock most anywhere on the local network if DHCP successfully configured it.



The finder.exe program is a software tool that can be used to locate the Ethernet interface just about anywhere on the local network. However, it cannot be used to configure the interface. Compare

the MAC address on the product label with those listed on the finder.exe program. If there is a match, then the IP address will be listed next to it.

Once the IP address is discovered, click on the desired address to configure. Then, click on the "Browse" button to access the configuration menu where the IP address, net mask, and gateway address can be entered.

Another method of configuring the Ethernet interface is to connect the PC directly to the Ethernet interface using a special cross over cable. Later model computers will automatically detect the need to cross over the signal pairs. All network connections must be disabled on the computer except "Local Area Connection". Right click on the network icon at the bottom of the screen. Click on "Open Network Connections", or go to, Start > Control Panel > Network Connections. If "Local Area Connection" is not the only enabled connection, right click on the other connections and click on disable.

Network Interface Configuration Web Interface

The main page displays a variety of general information about the configuration and activity of the Ethernet interface.

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Main Page

Clock Configuration: Configure clock-specific settings.
TCP/IP Configuration: Configure the TCP/IP settings for the network interface.
SNTP Servers: Configure the list of SNTP servers.
Security: Modify the user login password.
Upload Firmware: Upload a new firmware image to the device.
Reboot: Reboot the device.

Status

Current Time: GMT = 12/26/2010 19:07

Ethernet

MAC Address: 00:40:9D:45:A1:08
 IPv4 Addresses: 192.168.42.103
 169.254.62.151 (Auto-IP)
 IPv6 Addresses: FE80::240:9DFF:FE45:A108

Up Time: 3 days 3 hours 22 minutes 47 seconds
 MAC Address: 00:40:9D:45:A1:08
 Firmware Version: v4.01

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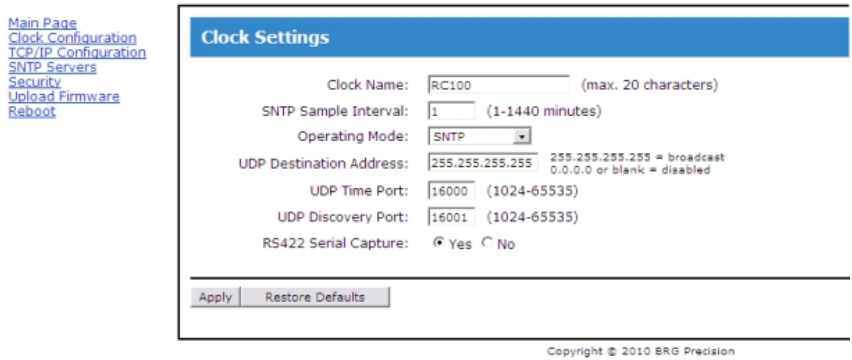
User Name and Password

The menu in the left column allows selecting several sections of the interface. A user name and password is required to enter any section other than the main page.

The default user name is: user
 The default password is: password

The user name and password should be changed after installation. Store the user name and password in a safe location for later reference.

Clock Configuration



Clock Name - is the user defined name used to identify the device during a network search.

SNTP Sample Interval - is the time in minutes between SNTP time updates. The default is one minute.

Operating Mode - defaults to SNTP and should not be changed unless directed by factory technical support staff.

UDP Destination Address – is the IP address for the clock to send responses to, typically the control PC.

UDP Time Port – default 16000, for UDP time broadcasting, not usually used for SNTP time acquisition.

UDP Discovery Port - default 16001, for UDP commands and discovery by the Windows control program.

RS422 Serial Capture – is used by factory support staff only.

Click on the Apply button to save changes.

TCP/IP Configuration

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Network Configuration

IP v4 Settings

Enable DHCP

IP v4 Address:

Subnet Mask:

Default Gateway:

Primary DNS:

Secondary DNS:

IP v6 Settings

Enable DHCP v6

Use the following static IP v6 address

IP v6 Address:

Prefix Length:

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Enable DHCP – check to enable automatic IP address configuration using DHCP. Uncheck to use manual address configuration. The address fields will be grayed out when checked.

IP v4 Address – enter the IP address using version 4 protocol

Subnet Mask – enter the subnet mask

Default Gateway – enter the gateway IP address

Primary DNS – Domain Naming Service address - required if one or more alphabetic named SNTP servers will be used. Not required if all SNTP server addresses are numeric.

Secondary DNS - Domain Naming Service address - optional

The factory default addressing mode is DHCP. If your network has a DHCP server, simply connect the clock to your network and the clock will acquire a leased IP address. The lease acquisition can be almost immediate or may take several minutes. You can use the Clock Control program to determine the leased IP address by going to Setup/Clock IP Discovery. You may not see your clock listed in the discovery panel until it has acquired a lease. You cannot access the Ethernet interface until it's acquired an IP address. Once the clock has acquired an IP address, you then select the clock from the discovery listing by clicking on it. Then click the browse button to open a session to the Ethernet interface.

SNTP Time Servers

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SNTP Servers

Server Name		IP address:
1	time-a.timefreq.blrdoc.gov	132.163.4.103
2	129.6.15.28	129.6.15.28
3	time-b.timefreq.blrdoc.gov	132.163.4.101
4	time.nist.gov	192.43.244.18
5	204.34.198.40	204.34.198.40
6	204.34.198.41	204.34.198.41
7	192.5.41.41	192.5.41.41
8	time-nw.nist.gov	131.107.13.100
9	192.5.41.40	192.5.41.40
10	time-b.nist.gov	129.6.15.29

In each field, enter the hostname (e.g. ntp.usno.navy.mil) or IP address (e.g. 192.5.41.42) of an SNTP time server. At least one DNS server must be configured for hostnames to resolve correctly (see the "Network Configuration" page). If no DNS servers are configured, only numeric dotted IP addresses will function.

PLEASE NOTE: If an invalid DNS server is entered on the "Configuration" page, the system may become slow and unresponsive. Please ensure that the DNS server settings are correct. If there are no DNS servers available, make sure that the "Primary DNS" and "Secondary DNS" fields are empty.

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Server Name – enter the numeric IP addresses or alphanumeric named addresses of the desired network time servers. The default configuration includes ten government time server addresses.

Once the clock has an IP address it will attempt to contact the first SNTP time server in the list. If the network firewall prevents the clock from reaching the Internet, change the SNTP addresses listed to only local network SNTP time servers. Remove any server addresses outside the local network.

Security

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Security

Enter New Password:

Confirm New Password:

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Change the password as needed. Be sure to store in a safe location for future reference. Click on the Apply button to invoke the change.

Reboot

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Reboot

Click Reboot to reboot this device.

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Click on the Reboot button to restart the network interface.

Time Synchronization Problems

If your clock is not synchronizing with an Internet SNTP time server, check the following items:

- The NIC must have a valid DHCP or fixed IP address.
- The NIC must be in the SNTP operating mode.
- If you are using fixed IP addressing, the clock must have the correct gateway address to access the Internet. The gateway is the first router that the clock must go through to access other networks or the Internet.
- Your network firewall must allow the clock to access the Internet through port 123.
- The clock must have the default NTP timer server IP address loaded into the NIC.
- If using named SNTP servers, be sure a valid DNS address is provided, or use only numeric SNTP server addresses.

If your clock is not synchronizing with a local network NTP time server, check the following items:

- The NIC must have a valid DHCP or fixed IP address.
- The NIC must be in the SNTP operating mode.
- If you are using fixed IP addressing, the NIC must have the correct gateway if the server is on another network. The gateway is the first router that the clock must go through to access other networks.
- The correct NTP timer server IP address must be loaded into the NIC.
- If using named SNTP servers, be sure a valid DNS address is provided, or use only numeric SNTP server addresses.

Technical Support

For BRG Technical Support, call 1-316-788-2000, 8am-5pm, U.S. Central time, or email www.support@brightclock.com.

Power over Ethernet Option (PoE)

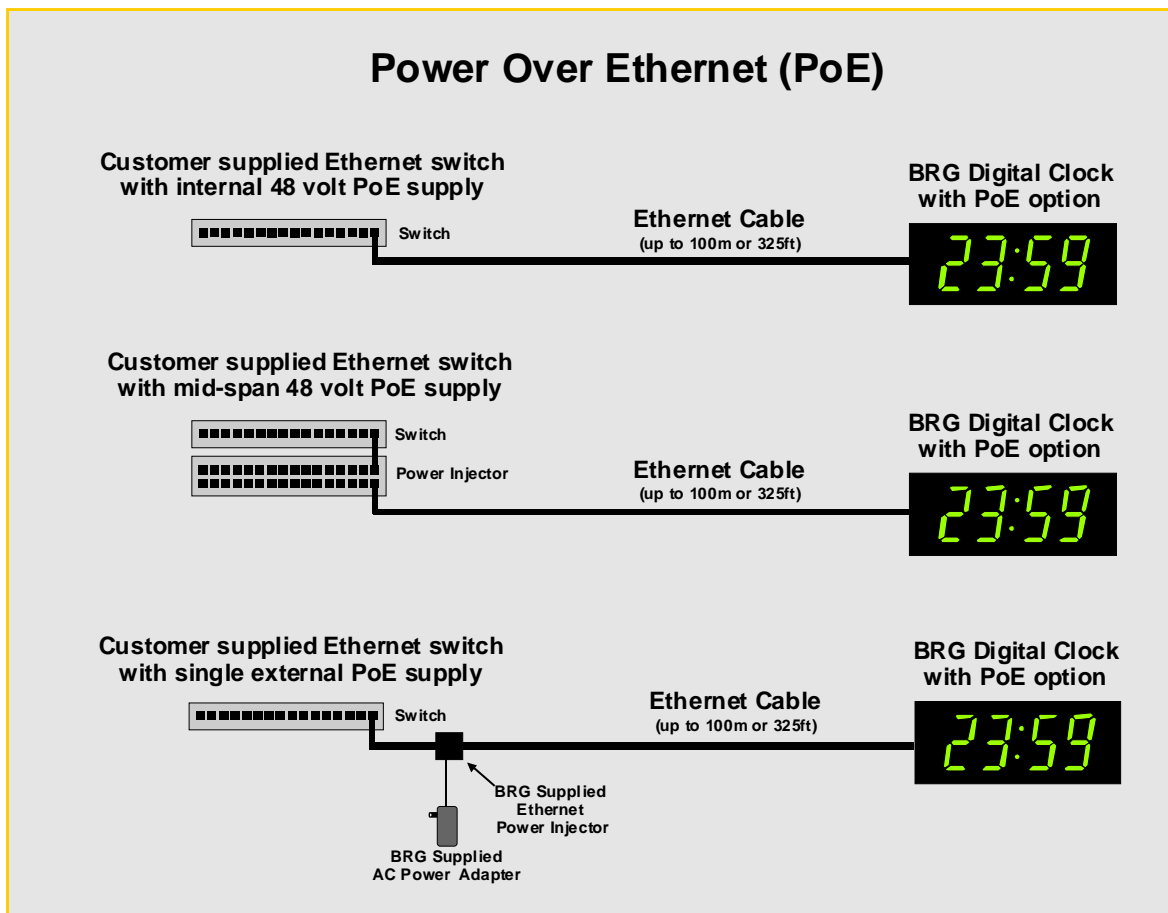
Power-over-Ethernet (PoE) is a network standard based on IEEE 802.3af that provides a means of delivering power to devices connected to the LAN. This technology eliminates AC electrical wiring, wall transformers, allows centralized UPS backup, and is fully compatible with both powered and non-powered Ethernet devices.

In addition to providing time synchronization and control over Ethernet, PoE enabled Ethernet cable provides power to the clock. System installers need run only a single Ethernet cable that carries both power and data to each clock. This allows greater flexibility placing clocks and, in most cases, significantly decreases installation costs. BRG clocks are fully compliant with the IEEE 802.3af standard for providing power over Ethernet. The clocks will work with older non-standard and passive power sources, as well as newer, auto-sensing PoE switches and mid-span power injectors.

Power-over-Ethernet begins with a Ethernet power source such as a PoE compatible Switch or a mid-span power "Injector". These devices insert power onto the Ethernet cable. The power source is typically installed in the "wiring closet" near the Ethernet switch or hub.

Clocks may be ordered as PoE compatible by adding the (P13) power option. This option adds the necessary circuitry to fully implement the IEEE 802.3af standard. PoE is able to supply a maximum of about 15 watts of power over the Ethernet cable. This means that not all clocks are candidates for PoE.

If the access point is not PoE compatible, BRG offers single port mid-span power injectors designed to provide power to a single clock (P14 power option). Multiport mid-span PoE power injectors are available from most network equipment vendors. The voltage injected is 48 volts DC at 0.35 Amps.



Serial Wire Synchronization

The RS-422 protocol used for wire sync communications greatly expands the practical possibilities of the serial bus. It provides a mechanism by which serial data can be transmitted over great distances (to 4,000 feet). This is accomplished by splitting each signal across two separate wires in opposite states, one inverted and one not inverted. The difference in voltage between the two lines is compared by the receiver to determine the logical state of the signal. This wire configuration, called differential data transmission, or balanced transmission is well suited to noisy environments. With balanced transmission, this potential difference will affect both wires equally, and thus not affect their inverse relationship. Twisted pairs of wire, which ensure that neither line is permanently closer to a noise source than the other, are often used to best equalize influences on the two lines. Errors can also be caused by high noise levels which affect one side of the receiver to a different extent than the other. To combat this, each receiver is generally grounded.

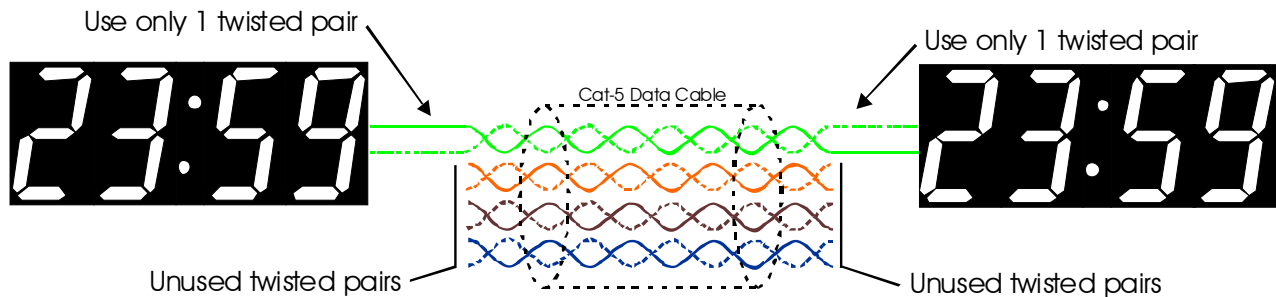
RS422 Serial Communications

BRG clocks utilized an industry standard RS422 buss transceiver that meets or exceeds ANSI Standards EIA/TIA-422-B and ITU Recommendation V.11. This device includes the following features for improved reliability: USE ONLY RS422 VOLTAGES. DO NOT APPLY POWER VOLTAGES TO THE SYNC WIRING.

1. Thermal Shutdown Protection
2. Positive and Negative Current Limiting
3. 60 mA Output Current
4. Automatic Noise Suppression

One BRG clock will drive up to 5 slave clocks when wired in parallel, or an unlimited number of clocks if they include an input, and output and are wired in series.

Common Cat-5 twisted pair data cable may be used to carry serial data between clocks. DO NOT USE POWER WIRE OR NON-TWISTED WIRE AS DATA CABLE.



Diagnostics –

With power applied to the clock, connect a red ohm meter lead to the red Input sync wire and the black ohm meter lead to the black Input sync wire. You should see a reading of 120 ohms. A lower resistance indicates a short in the sync wiring or clock circuit. A higher resistance indicates a disconnected sync wire or a problem with the clock's sync circuit.

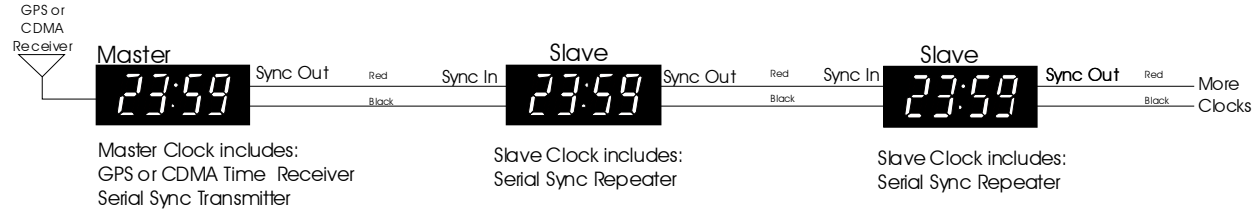
The sync output of the clock may be measured with a volt meter. There should be 5 volts when the meter's red lead is connected to the red Output sync wire, and the meter's black lead connected to the clock's black Output sync wire. If the clock is configured as a master to send sync data once per second, you will see a momentary voltage drop using an analog meter. Digital meters may not be fast enough to detect the sync pulse. If the clock is configured as a repeating slave, it will only send sync data when sync data is received. In other words, it is configured to repeat all sync data received.

LED sync detector –

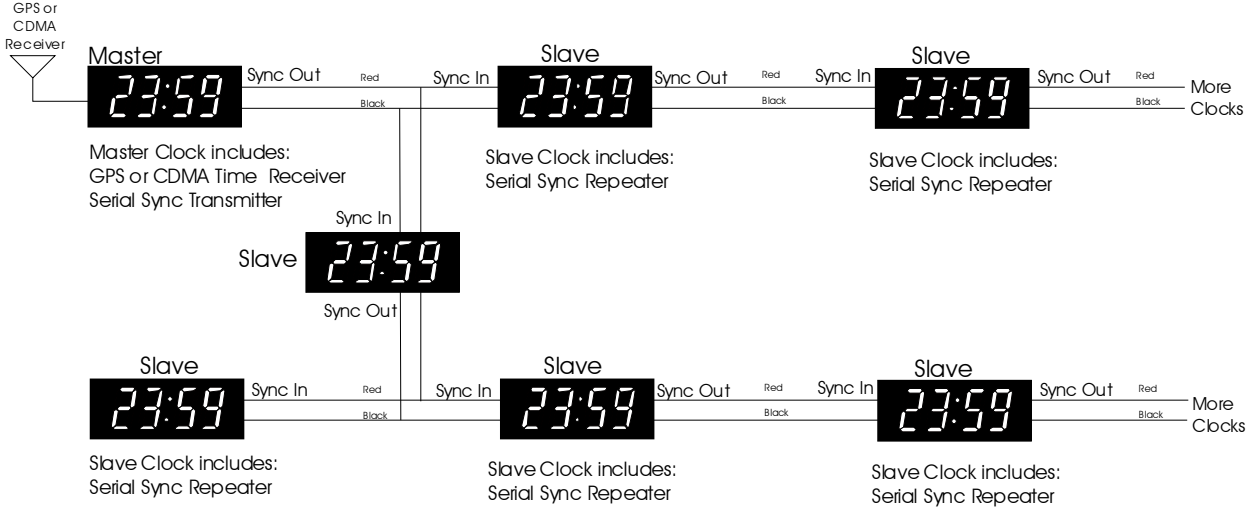
A common LED (light emitting diode) may be used to detect the presence and polarity of sync data. Connect the anode of the LED to the red Output sync wire and the LED cathode to the black Output sync wire. On most 5mm LED's, the anode lead is the longer of the two leads. The LED should continuously illuminate. If the clock is configured to transmit, the LED should blink off momentarily when the sync data is sent. If the LED polarity is reversed, the LED will remain off. When the clock sends sync data, the LED will blink momentarily.

Wired Synchronization Examples

The following example illustrates how all clocks may be synchronized to the master using only two wires. The slave clocks repeat the sync signal. Use Cat-5 twisted pair wire for up to 4,000 feet between any two clocks.



The following example illustrates how the sync wiring may be "T" or "Y" connected to supply more clocks. Any Sync Output may be split to supply two other clocks. This allows greater flexibility during installation.



PC USB / RS422 Adapter

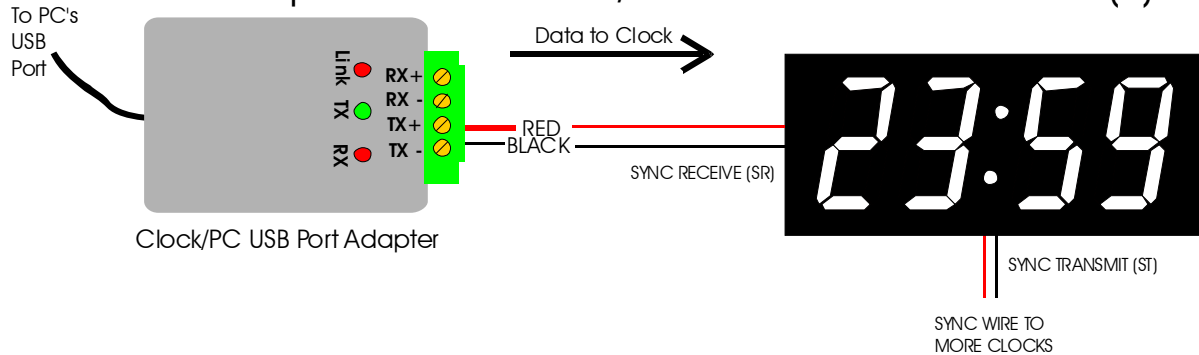
USB/422 Adapter

This option allows the clock to be set by PC or the PC to be set by the clock. A USB interface adapter is included for connecting the clock to a computer. Simply attach the adapter to the clock sync line and plug into the PC's USB port. A software CD is included for the Windows operating system. A driver is also included on the BRG Digital Clock controller software CD under the directory – USB Adapter Driver 2.0. The driver can also be downloaded from <http://www.brgprecision.com>. Windows will detect the USB connection and will direct you to insert the CD. Once connected, the time and date may be exchanged between the PC and clock(s). The scheduling program included with Windows can be configured to run the time send software anytime between once per minute and once a day, or longer. The serial sync options, ST and/or SR, are required. This will strip off daylight savings time and convert the local time to UTC time for use by the time zone display. One BRG clock will drive up to 5 slave clocks when wired in parallel, or an unlimited number of clocks if they include and input and output and are wired in series.

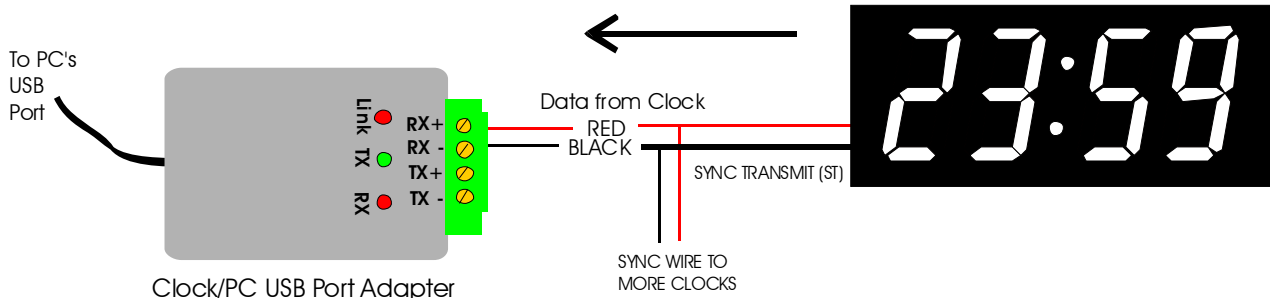
PC/Clock USB Interface Adapter package includes: USB Adapter, USB patch cable, software CD, installation and operating instructions (this sheet). **The USB adapter draws its' power directly from the USB port. No AC power module is required.**

PC / Clock USB Port Adapter

Example 1 - Send time/date from PC to CLOCK(S)



Example 2 - Send time/date from CLOCK to PC



PC Serial RS232/RS422 Adapter

Ic485-I Adapter

This option allows the clock to be set by PC or the PC to be set by the clock. A serial interface adapter is included for connecting the clock to a computer. Simply attach the adapter to the clock sync line and plug into the PC's serial port. Software is included for DOS, Windows 3.x, 95, 98, NT, ME, XP and 2000. Once connected, the time and date may be exchanged between the PC and clock(s). The scheduling program included with Windows can be configured to run the time send software anytime between once per minute and once a day, or longer.

RS422 Serial Communications

BRG clocks utilized an industry standard RS422 buss transceiver that meets or exceeds ANSI Standards EIA/TIA-422-B and ITU Recommendation V.11. This device includes the following features for improved reliability:

1. Thermal Shutdown Protection
2. Positive and Negative Current Limiting
3. 60 mA Output Current
4. Automatic Noise Suppression

One BRG clock will drive up to 5 slave clocks when wired in parallel, or an unlimited number of clocks if they include an input and output and are wired in series.

Diagnostics –

With power applied to the clock, connect a meter's red lead to the red Input sync wire and the black meter lead to the black Input sync wire. You should see a reading of 12 K ohms. A lower resistance indicates a short in the sync wiring or clock circuit. A higher resistance indicates a disconnected sync wire or a problem with the clock's sync circuit.

The sync output of the clock may be measured with a volt meter. There should be 5 volts when the meter's red lead is connected to the red Output sync wire, and the meter's black lead connected to the clock's black Output sync wire. If the clock is configured as a master to send sync data once per second, you will see a momentary voltage drop using an analog meter. Digital meters may not be fast enough to detect the sync pulse.

If the clock is configured as a repeating slave, it will only send sync data when sync data is received. In other words, it is configured to repeat all sync data received.

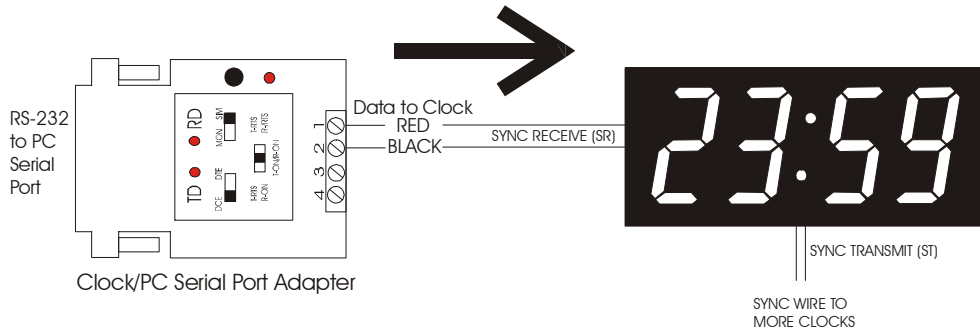
LED sync detector -

A common LED (light emitting diode) may be used to detect the presence and polarity of sync data. Connect the anode of the LED to the red Output sync wire and the LED cathode to the black Output sync wire. On most 5mm LED's, the anode lead is the longer of the two leads. The LED should continuously illuminate. If the clock is configured to transmit, the LED should blink off momentarily when the sync data is sent.

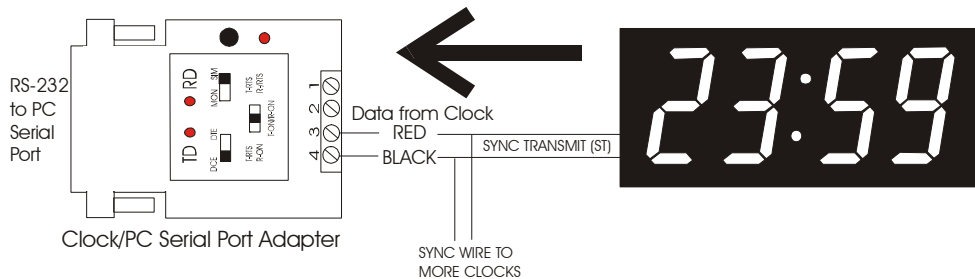
If the LED polarity is reversed, the LED will remain off. When the clock sends sync data, the LED will blink momentarily.

PC/Clock Serial Interface Adapter package includes: Serial Adapter, 9 to 25 pin adapter, software CD, installation and operating instructions (this sheet). **The serial adapter draws its' power directly from the serial port. No AC power module is required.**

Example 1 - Send time/date from PC to CLOCK(S)



Example 2 - Send time/date from CLOCK to PC



59th Minute Analog Master Clock Operation

Description

A single BRG digital clock may control 500 or more 59th minute analog slave clocks. 59th minute analog clocks are used for their increased reliability over older analog clock systems. The 59th minute analog clock contains a microprocessor that greatly reduces the power required compared to older clock designs. No relays, ratchets or pawls are used. All power and sync pulses to the analog clocks are provided over a simple three-wire circuit. The master clock sends minute and second correction impulses hourly. Additionally, at 5am and 5pm, the hour is corrected. In the event of a power outage, the master clock will continue to keep time up to ten years. When the power returns, the master clock will correct the analog clocks at the next regular sync interval. If continuous time display is required during a power outage, a simple off-the-shelf uninterruptible power supply (UPS) will provide many hours, if not days of operation for the entire system.

Installation

It is recommended to use 14 ga. to 16 ga. wire between the master clock and analog clocks. Any wiring layout may be used including star, "T", and buss configurations. More wiring "legs" will reduce overall wiring resistance. All wiring should be in parallel. If the master clock needs to be removed for any reason, the slave clocks will continue to operate normally, although they will no longer receive correction pulses from the master clock.

If a single clock needs to be removed for any reason, unplug the connector plug from the analog clock's pins. The master clock may remain powered. To return an analog clock to operation, plug the connector back onto the analog clock's pins. The clock will be corrected at the next regular sync interval.