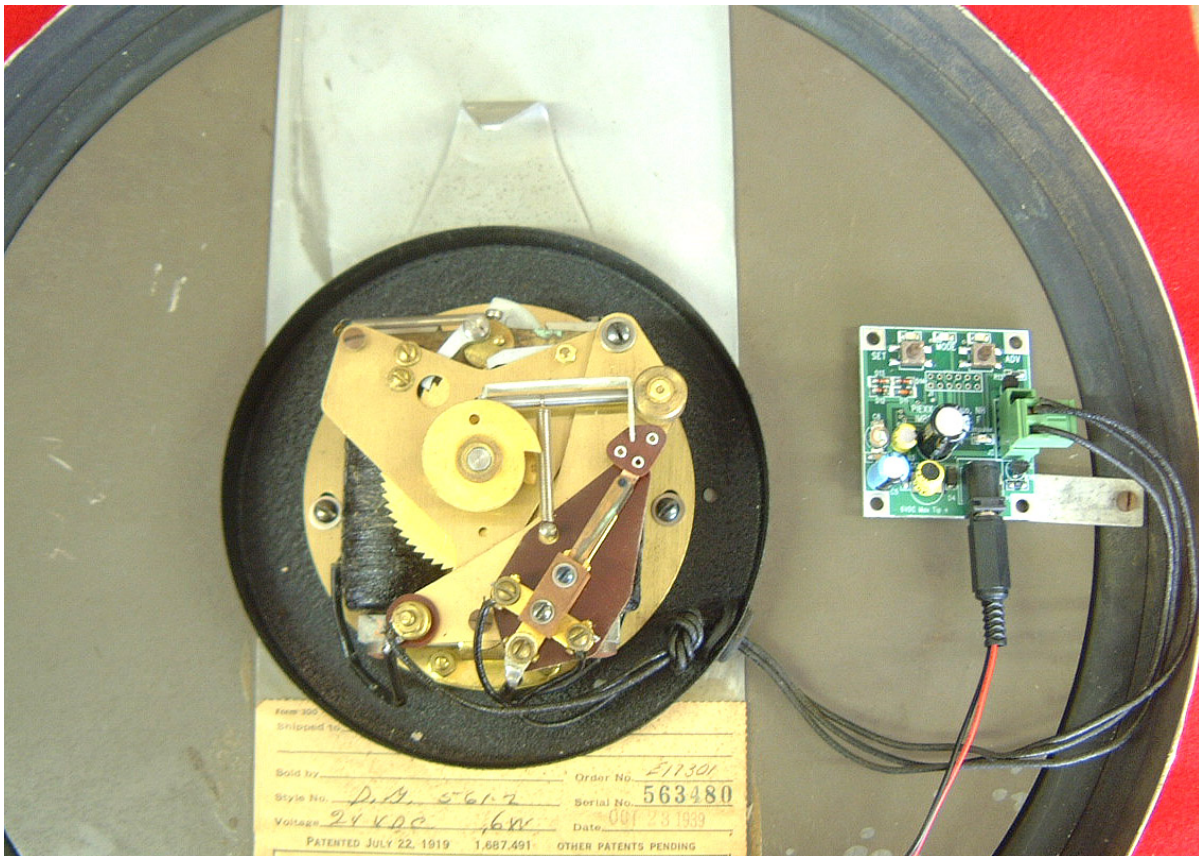


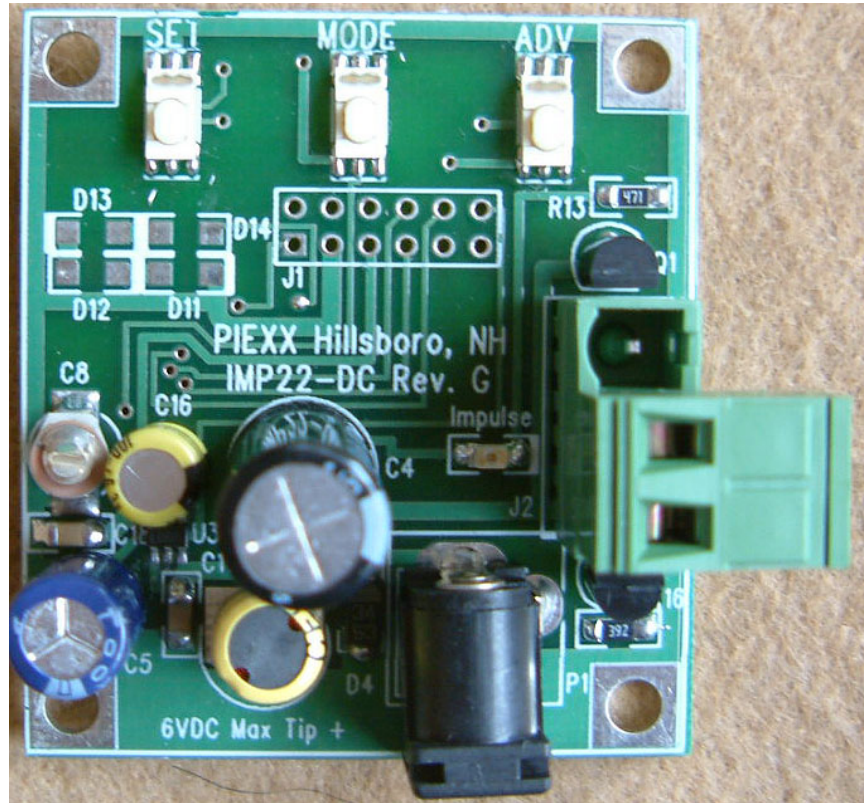


PIEXX Co.
13 Main Street
PO Box 123
Hillsboro, NH 03244
(603) 464-5411
www.piexx.com

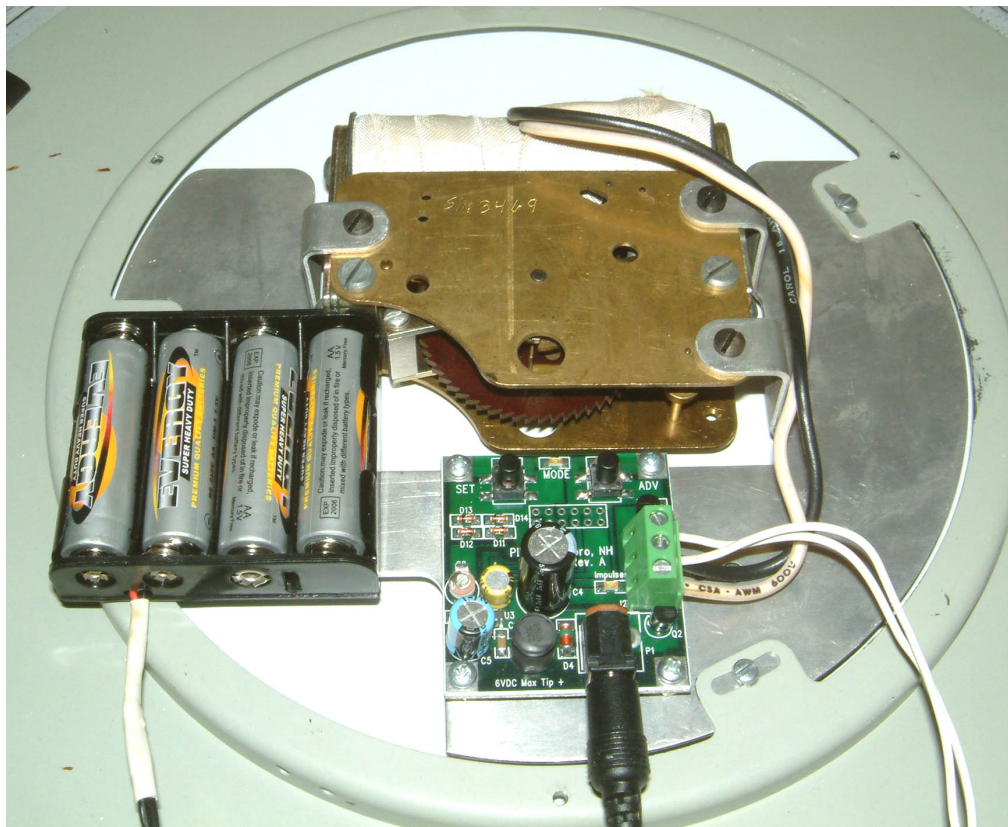
Model IMP-22K V2 Low Cost Slave Clock Impulser
Converts your slave clock to a working timepiece without modifying its original mechanism.



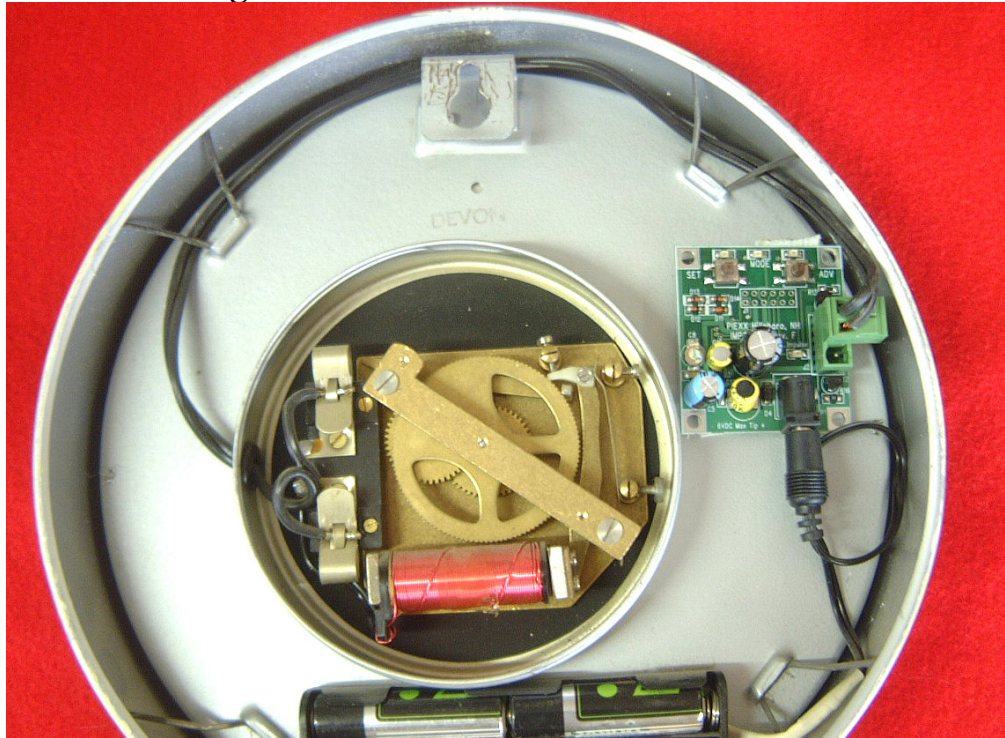
- **The PIEXX IMP-22K allows you to put your slave clock back into operation without modifying its original, historically significant mechanism.**
- **Will produce either 1 to 60 impulses per minute for American or Gents, Brille mechanisms.**
- **Will produce either unipolar or bipolar (polarity reversing) clock pulses.**
- **Accurate, microprocessor based design will keep time to within a minute a year.**
- **Battery operated from 3.5-6VDC batteries. No other battery voltages required!**
- **Easy installation.**
- **Hour / minute advance retard feature allows for easy setting.**
- **Ready to go for 5, 12 or 24 VDC clocks.**
- **Hour Synchronizer output available for International 3 Wire, Synch Solenoid and reverse polarity synchronizers.**



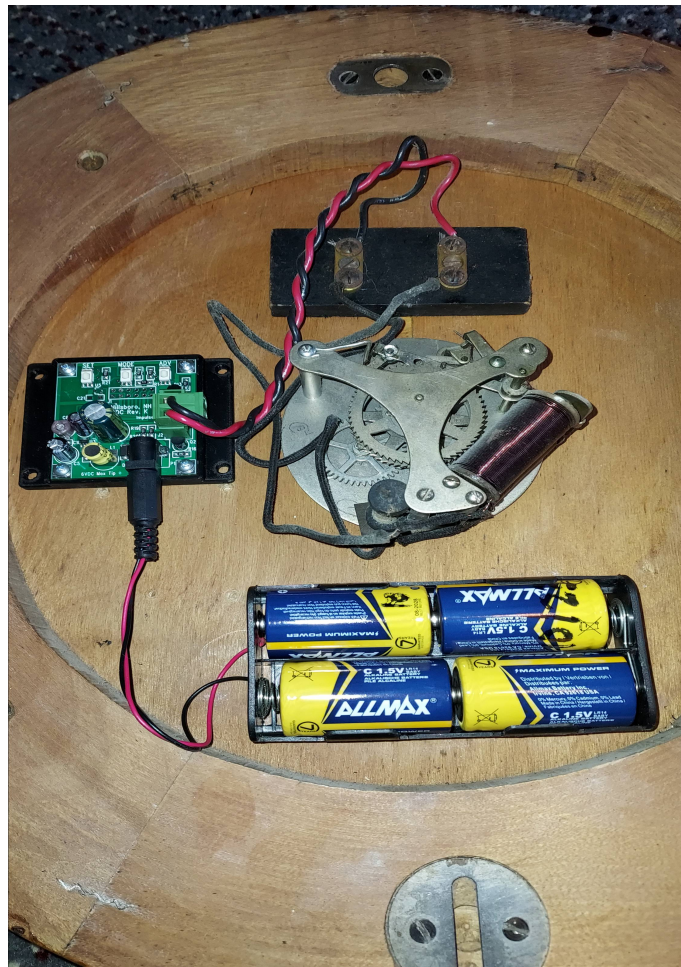
The IMP-22K is only 2.05" x 1.85"



IMP-22 Inside Stromberg Clock. The 2 white wires connect to the strike mechanism.



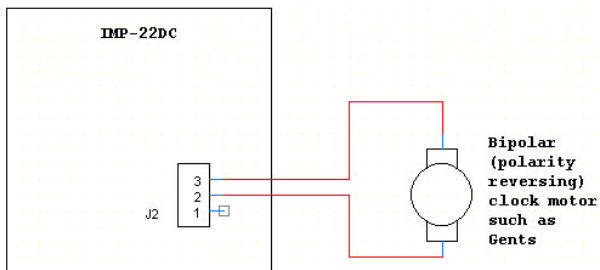
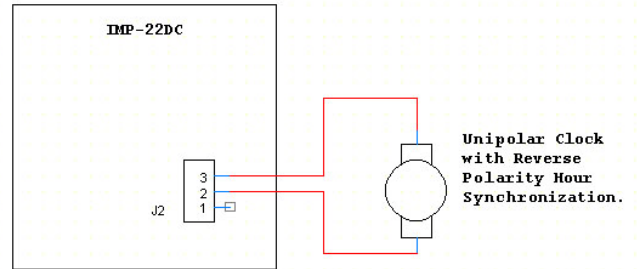
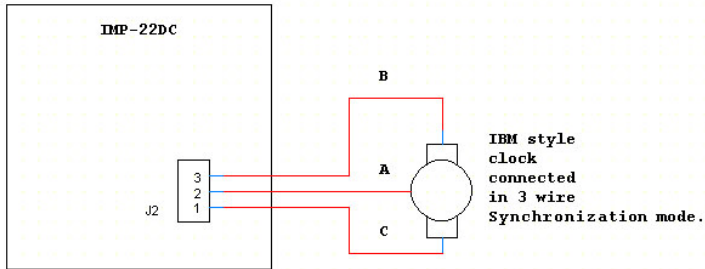
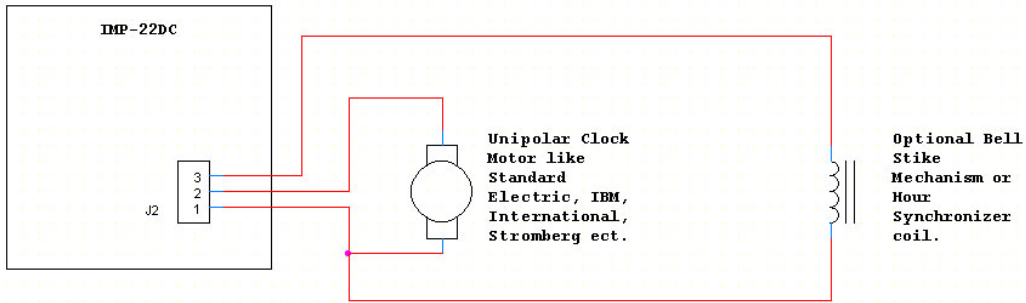
IMP-22 Inside Gents Clock. Since the Gents Mechanism is Bipolar, clock leads are in the top two terminals of the IMP-2 terminal Strip.



IMP-22K V2 Connected to a Low Voltage Early Standard Electric Clock.

Installation

1. Install your IMP-22K, and its battery pack, in a convenient spot in your clock. These components may be secured with screws, or double stick foam tape. If you elect to screw down the IMP-22K, be sure to use ¼” or greater standoffs to insulate the rear of the board from any metallic enclosure.
2. Unplug the removable 2 pin terminal plug from the 3-pin J2 terminal strip. **You should never modify the wiring to this plug while it is installed in the J2 connector of the IMP-22K!**
3. Connect the 2, stripped, wires from your clock mechanism to the 2 pin terminal plug.
4. If you are using the IMP-22K to run a Standard Electric, IBM, International, Stromberg or other unipolar clock mechanism, install the 2 pin terminal plug into the bottom 2 connections on the J2 (green) terminal strip. If you are using a bipolar, or polarity reversing type of clock mechanism, connect the 2 pin terminal plug into the top 2 connections on the J2 terminal strip. If you are using a bipolar installation, you will not be able to make use of the hour strike feature of the IMP-22K.
5. Install 4 fresh alkaline batteries in the battery pack. If you want to power the IMP-22K from a wall supply, you may connect it to the P1 power jack in place of the battery supply. Use a regulated 5VDC wall power supply like those commonly used on USB or Ethernet hubs. We sell the appropriate AC wall adapters through our web site. The 2.1mm power connector is set up to accept a 3.5-6VDC center positive connector. **Under no circumstances should you apply more than 6VDC to this connector!**
6. If you are using a unipolar clock motor, there exists an extra output that can be used to sound an hour striking or ships watch bell. If you would like to use this feature, connect the bell strike solenoid between the upper two connections, pins 1 and 3, of terminal strip J2. You will have 2 wires, one to the strike mechanism and one to the clock motor in the bottom connection on J2. You will need to purchase a 3 position terminal plug to make use of the strike feature.



Piexx Hillsboro, NH		
Title		
IMP22-DC Wiring		
Size	Document Number	Rev
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Date:	Monday, October 06, 2008	Sheet 1 of 1

Operation

All of the IMP-22Ks parameters are entered via three push buttons, **SET**, **MODE** and **ADV**. Program feedback is displayed on 3 LEDs, **SET**, **ADV** and **MODE**. In addition there is a LED, labeled **Impulse**, that shows the status of the IMP-22Ks 24VDC internal power enable. In general, the **Impulse** LED will light up just prior to the clock mechanism advance pulse.

Number Entry and Display:

Through out these instructions you will notice that there are certain numeric parameters that are either displayed or entered. In all cases the display and entry follows the following convention:

- **Display** – Numeric values are displayed by blinking the LED associated with that parameter. The blinking LED will be a series of long flashes, indicating tens units, followed by a series of short flashes, indicating the single units. A long flash lasts $\frac{1}{2}$ second and a short flash lasts $\frac{1}{10}$ of a second. The numeric value, indicated by the flashing LED sequence, is generally repeated until another function is performed. As an example, the value 32 will be shown on the LED display as 3 long flashes followed by 2 short flashes.
- **Entry** – Numeric values are entered in much the same way as they are displayed. To enter tens units, press and hold the button associated with the parameter to be entered for a period of at least $\frac{1}{2}$ second. To enter single units, press the button quickly. While in the numeric entry mode simultaneously pressing the **SET + ADVANCE** buttons will clear the number to its initial value. If you simultaneously press the **SET + ADVANCE** buttons a second time, the entry mode will be stopped.

Entering the Parameter Set Up Mode:

The parameters that control the way that the IMP-22K operates with your clock are entered through various mode values. In many cases the mode data associated with the more common slave clocks may be simultaneously preset by simply selecting the appropriate clock type in the first mode. In order to enter the Set Up Mode, press and hold, for about a second, the **MODE** button. Upon entering the Set Up Mode, the **MODE** LED will flash the numeric value of the currently selected mode, indicating which mode value you are viewing, and the **SET** LED will flash the value of that mode, or what it is equal to. The first mode entered, after pressing and holding the **MODE** button, will always be the **Set Clock type** mode, which is mode 1

For many installations, mode 1, the Set Clock Type mode, is the only mode value you will need to set.

The **Set Clock Type** mode acts as a preset for the other clock settings. There are 5 available presets associated with the **Set Clock Type** mode:

1. Standard Electric, Stromberg – This is the most commonly used Clock Type.
2. IBM, International- Used with the slower ‘meter movement’ style IBM clocks.

3. Gents, other European- This is the Clock type to use with alternating polarity, 2 impulse per minute slave clocks common in Europe.
4. Modern Stromberg Clocks
5. Manual setup- If this clock type is selected, you can manually adjust the various clock parameters.
6. Brille - If you have an IMP-22 manufactured after January 2007, then clock type 6 is the appropriate setting for the low voltage alternating polarity Brille clocks. Also the latest firmware advances the clock at even time intervals throughout the minute. For example, if the IMP-22 is set to generate 2 pulses per minute, then the clock will advance every 30 seconds.
7. Flip Clock – This clock type works well with slow actuating alternating polarity 24VDC clocks like the Solari Udine Cifra 6 flip clock.
8. Western Union Hour Synchronizer – The synchronizer output, load between pins 1 and 3 of the green 3 pin output connector, is pulsed for 2 seconds once every hour. The output is set for 24 VDC by default.
9. Low Voltage Standard Electric – This clock type uses a PWM output on the clock advance terminal to provide a lower voltage output for early Standard Electric clocks.

To move between the various clock types, press the **SET** button. Each time you press the **SET** button, the **SET** LED will begin flashing the new Clock Type value selected. In order for the Clock Type selected to take effect, press and hold, for about a second, the **MODE** button. Entry of the new Clock Type preset will be acknowledged by 4 alternating flashes on the **SET** and **ADVANCE** LEDs.

Other Clock Set Up Parameters (modes):

If the clock set up parameters preset with Clock Type mode are not to your liking, you may override these values by selecting the manual setup, that is a value of 5 in the Clock Type mode, mode 1. If manual mode is selected in the Clock Type setting, you can advance to the other 11 parameter setting modes by pressing the **MODE** button. As you would expect, the **MODE** LED will flash the value of the currently selected mode. *You will not be able to advance to other modes unless the Clock Type mode is set to 5, the manual setup mode.* You may leave the Mode Setting menu by pressing and holding, for about a second, the **MODE** button. Alternatively, the IMP-22K will automatically exit the Set Mode menu if you don't make any key entry for about 2 minutes.

Below is a description of what each of the 11 modes adjustments available in the IMP-22K:

1. Clock Type Mode – As previously described.
2. Clock Pulse Width- This mode sets and shows the relative pulse width of the clock advance pulse. The pulse width will be different depending on the manufacturer of the clock mechanism that you will be operating. In all cases you should use the lowest value that will reliably operate your clock mechanism. The lower the Clock Pulse Width value, the shorter will be the duration of the clock actuation pulse and the longer your batteries will last. The Solenoid style mechanisms used in Standard Electric, Stromberg and some IBM mechanism will generally work with clock pulse widths in the order of 6-10. The 'meter movement' styles of IBM or International mechanisms require a longer pulse in the neighborhood of 20-30. If your mechanism

is dirty and sluggish, and you compensate by applying a greater clock pulse width, you will pay by reducing the battery life of the IMP-22K!

3. Clock Voltage Mode- The IMP-22K can either produce 5, 12 or 24 volt clock advance pulses as indicated by the value indicated in Mode 3. The IMP-22K will generate 24V DC clock advance pulses if mode 3 is set to 1, 12V DC if set to 2 or 5V DC if set to 3.
4. Advance Pulses per minute Mode- The value of mode 4 will determine the number of pulses sent to your clock mechanism each minute. Most clocks require 1 advance pulse per minute, but you can set mode 4 to generate multiple pulse each minute.
5. Clock Advance Unipolar or Bipolar Mode - Most of the mechanism that we come into contact with are unipolar. That is, they don't require an alternating polarity clock impulse. There are some mechanisms that require a bipolar or alternating polarity clock advance impulse. Setting mode 5 to a value of 1 will set up the IMP-22K for unipolar operation. A value of 2, in mode 5, sets the IMP-22K for bipolar operation. If you choose the bipolar mode, the 2nd IMP-22K output will not be available for strike operations
6. Speed Up clock Mode- Entering a value of between 1 and 99 in mode 6 will cause the IMP-22K to run faster by the numeric value entered times .1 seconds per day. In other words, if you enter a value of 10 into mode 6, the clock will run faster by 1 second each day. Although the IMP-22Ks crystal oscillator is very accurate, use of this mode will allow you to really fine tune the running speed of the clock.
7. Slow Down clock Mode- Entering a value of between 1 and 99 in mode 7 will cause the IMP-22K to run slower by the numeric value entered times .1 seconds per day. In other words, if you enter a value of 10 into mode 6, the clock will run slower by 1 second each day.
8. Minute Set Mode- This mode is used to synchronize the minute hand with the strike operation of the IMP-22K. The value entered will be between 0 and 59 and should correspond with the current setting of your clocks minute hand. If you are not planning on using the strike mode of the IMP-22K, there is no need to set this mode parameter.
9. Hour Set Mode- This mode is used to synchronize the hour hand with the strike operation of the IMP-22K. The value entered will be between 0 and 23 and should correspond with the current setting of your clocks hour hand. If you are not planning on using the strike mode of the IMP-22, there is no need to set this mode parameter.
10. Chime Style Mode- This mode sets the type of strike that the IMP-22K will generate. The 5 values that can be selected are:
 - 1 = Hour strike.
 - 2 = Hour + half hour strike.
 - 3 = Ships watch strike.
 - 4 = Westminster strike (requires optional board).
 - 5 = Strike deactivated.
11. Strike Pulse Width Mode- This mode adjusts the width of the pulse sent to the strike mechanism. The pulse width will be different depending on the striking mechanism you adopt, but as with the clock advance pulse, the lower the number the longer your

batteries will last. Typically the strike pulse width will be a very small number, 1-5, and the tone and volume of the bell will be affected by the value selected. Again, if you are not planning on using the strike mode of the IMP-22K, there is no need to set this mode parameter.

12. Synchronizer Output Type – This mode set the type of hour synchronization. If selected, Chime modes will not be available as the 2nd output is used. Also, bipolar operation is not available if a hour synchronization is in use.

The four Hour Synchronization types are as follows:

0 = No Hour Synch used. This is the default type.

1 = IBM A+B style. This Synch type will send a number of extra pulses, defined by Hour Synchronizer Extra Pulses, on the A output line at the Hour Synchronizer Start Time. Then, from the Hour Synchronizer Start Time until the Hour Synchronizer End Time, both A and B outputs will be generated.

2 = Alternating Polarity Synch. The clock mechanism should be wired between pins 2 and 3 of the output connector, like a bipolar clock. Normally the clock will be advanced with one polarity. At the Hour Synchronizer Start Time, a number of additional normal polarity pulses will be generated. From the Hour Synchronizer Start Time until the Hour Synchronizer End Time, a reverse polarity pulse will be generated. This is used with certain magnetic catch type mechanisms, like the more modern Stromberg mechanism, as well as some clocks with a series diode shunted by a hour proximity switch.

3 = Single output at the hour. This can be used by Western Union style clocks or some of the Standard Electric clocks that have a Synchronizing coil. The idea is that when the coils is energized, the minute hand will 'fall' to the full hour position. The IMP-22K will send Hour Synchronizer Extra Pulses, usually set to 1, when the hour equals Hour Synchronizer Start Time, usually set for 0.

13. Hour Synchronizer Advance Pulse Width – This mode sets the advance pulse width applied to the hour synchronizer output.
14. Hour Synchronizer Start Time – This mode sets the time when the hour synchronizer will begin operation.
15. Hour Synchronizer End Time – This mode sets the time when the hour synchronizer will terminate operation.
16. Hour Synchronizer Extra Pulses – This mode sets the number of extra synchronizing output impulses that will be delivered.
17. Low Voltage PWM (0-30) (*Version K2 Firmware*) - This parameter sets the advance pulse output to a PWM mode. A value of 0 sets a non PWM mode; this is the normal operation. A value of 1 or greater sets a PWM mode where the advance output duty cycle is defined as Parameter Value / 31. The greater the parameter value the greater the apparent voltage.

Setting the Time:

To **Advance** the time of your clock by hours, press the **ADV** button the number of hours you would like to advance. The advance hour mode of operation is indicated by the **SET** and **MODE** LEDs being illuminated. The number of hours, to advance will be indicated by the number of flashes of the **ADV** LED in the format previously discussed. To institute the time change, press the **SET** key. At this time the clock will begin to advance by the number of hours that you programmed. You may terminate the advancing of the clock by pressing either the **SET** or **ADV** buttons.

To **Advance** the time of your clock by minutes, press and hold the **ADV** button for about ½ second. The advance minutes mode of operation is indicated by the **SET** LED being illuminated. You can add additional minutes by multiple short presses of the **ADV** button, or in 10 minute quantities by longer presses of the **ADV** key. To institute the time change, press the **SET** key.

To **Retard** the time, use the same procedure as that indicated for advancing the time but institute the time change by pressing and holding the **SET** key for about ½ second. Retarding the clock by more than an hour is accomplished by sending multiple minute advances until the correct retarded time is achieved. Retarding the clock by 1 hour or less is accomplished by stopping the impulse stream for as many minutes as programmed. When the IMP-22K is in the holding time mode, the **ADV**, **MODE** and **SET** LEDs will rhythmically strobe to the left.

Synchronizing the clock to the nearest second may be accomplished by pressing the **SET** button, to enter the Synchronize mode as indicated by the **SET** and **Impulse** LEDs lighting, followed by another press of the **SET** button at the time you would like the clock to advance to the next minute. If you don't make the second press of the **SET** button within 2 minutes, the IMP-22K will automatically exit the Synchronize mode.

Strike Test - You can force the IMP-22G to strike the current hour setting by pressing and holding the **SET** button for about ½ second.

Hour Synchronization - You can force the IMP-22K to set the full hour by pressing and holding the **SET** button for about ½ second. This will set the internal clock to 59 minutes, 58 seconds. So, 2 seconds after holding the **SET** button for about ½ second, the clock will advance to the full hour and perform whatever synchronization is appropriate. This only works if a chime mode is not in force.

Adjusting The Speed of the Clock:

The speed of the IMP-22K can be adjusted in increments of .1 seconds per day, up to a maximum of +/- 12 seconds a day, by a parameter entry via either mode 6 or mode 7. Before making these speed adjustments, you should make sure that your clock mechanism is faithfully

advancing each time it receives an impulse from the IMP-22K. Adjusting the IMP-22K speed to compensate for a mechanical error is a bad idea! To adjust the IMP-22K to run faster, input a value through mode 6 and then press and hold the MODE button for ½ second or longer. Similarly, to adjust the IMP-22K to run slower, input a value through mode 7 and then press and hold the MODE button for ½ second or longer. Each unit entered will cause the IMP-22K to run either faster or slower by 1/10 of a second per day. As an example, if you enter the value 15 via mode 6, the clock will run 1.5 seconds faster per day. When you leave either mode 6 or 7, the LEDs will display the total accumulated clock speed by first sequencing the LEDs to either the left or the right (left for slower, right for faster running) followed by the MODE LED blinking the speed the clock is adjusted for. If the speed of the clock is set at the factory default, that is the clock is not adjusted to run faster or slower, then the SET and ADV LEDs will alternately blink. This factory default setting can easily be restored by the following procedure:

1. Enter Mode 6
2. Simultaneously press *but do not* hold the Set and ADV buttons. This clears the input value as noted by the SET LED not blinking.
3. Press and hold the MODE button for ½ second, exiting the Adjust time mode.

Since this procedure restores the factor default clock speed, you will notice that, after step 3, the SET and ADV LEDs will alternately blink.

Clock Advance and Synchronizer Pulse widths:

The duration of the clock advance, and hour synchronizer, pulse widths are best determined empirically by adjusting the value for the most satisfactory clock advance. However, you can determine the specific clock advance time by the following equations.

The clock advance and synchronizer output pulse widths are set with a numeric value between 0 and 65 as follows:

0 = No output.

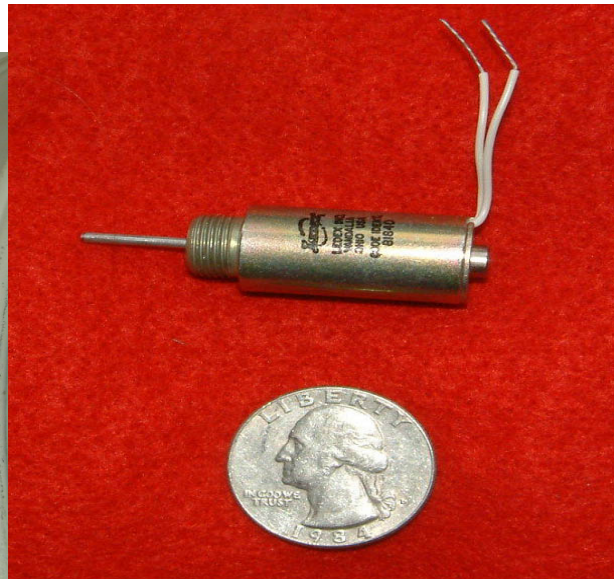
1 – 30 = Output is the numeric value times .005 seconds. For example, a setting of 10 would be a output pulse width of .05 seconds

31-50 = Output follows the equation $\text{OutPW} = ((\text{value}-30)*3+30) * .005$ seconds. So, the pulse widths in this range are between .165 and .45 seconds. A quarter second pulse is most closely selected with a pulse width value of 37.

51-60 = Output follows the equation $\text{OutPW} = ((\text{value}-50)*10+100) * .005$ seconds. So, the pulse widths in this range are between .55 and 1.0 seconds. A ¾ second pulse is most closely selected with a pulse width value of 55.

61-65 = Output follows the equation $\text{OutPW} = (\text{value}-60) * 1$ second, yielding a rang of 1 to 5 seconds. A 2 second output is achieved with a value of 62.

Outputs selected with a pulse width value of 50 or greater keep the IMP-22s power supply engaged during the whole advance pulse. If you are loading the outputs significantly, this can cause quite a drain on the batteries! Clock pulse width of this duration are almost never required by standard slave clock mechanisms and should be avoided!!



A 24VDC Solenoid mounted inside of a 4" Bell for Hour Strike

Some Programming Examples

We have had some requests for a few programming examples, so here we go...

Please make sure you understand the difference between *pressing* a button, and *pressing and holding* a button. *Pressing* a button means that you press and release the button like you would the keys on your computers keyboard. *Pressing and holding* a button means you press the button and keep it pressed for a half second or longer. In the examples below we will use both entry modes. If we mean for you to press and hold a button it will be indicated by that phrase, press and hold, otherwise, if press is indicated, it means just that.

In all of these programming examples you need to be in the regular time standby mode. So, if any LEDs are on or blinking, you can get back to the standby mode by simply unplugging the battery connector for a couple of seconds and then plugging it back in. The LEDs will blink in sequence a few times and then all of them will shut off. Now you are in the standby mode!

- 1. Advance your clock by 1 Hour** – Press the ADV button once, the SET and MODE leds will be illuminated and the ADV led will be blinking one blink at a time. Now press the SET button, the SET and ADV leds will be lit, the IMPULSE led will be flickering slightly, and the clock should be advancing one impulse at a time until it has advanced 1 hour. If you want to stop the clock from advancing, just press any key.
- 2. Retard your clock by 1 Hour** - Press the ADV button once, the SET and MODE leds will be illuminated and the ADV led will be blinking one blink at a time. Now press and hold the SET button, the SET, MODE and ADV leds will start sequencing to the right. The IMP-22G will keep this sequencing up for 1 hour during which time the clock will stop advancing. After 1 hour the clock will revert to its normal, advancing mode. If you want to interrupt the sequencing, and start the clock running again, just press any key.

3. Set the Clock type to Standard Electric, clock type 1 – Clock type 1, Standard Electric, is a good general purpose clock type that will work with many slave clocks. To change to clock type 1:

1. Press and hold the MODE button. The MODE led will now be blinking once, and the SET led will be blinking the number of the currently selected clock type.
2. Press the SET button to increment the count shown on the SET led until the SET led is blinking once.
3. Press and hold the MODE button to save clock type 1.

4. Set the Clock type to the Manual mode, clock type 5 – Clock type 5, the manual mode, is the clock type you must be in to change the various other IMP-22G parameters. For example, if you want to change the clock advance pulse width, you must have mode 1 set to clock type 5. To change to clock type 5:

1. Press and hold the MODE button. The MODE led will now be blinking once, and the SET led will be blinking the number of the currently selected clock type.
2. If the SET led is blinking 5 times you are already in the manual mode, so skip to step 4.
3. Press the SET button to increment the count shown on the SET led until the SET led is blinking 5 times.
4. Press and hold the MODE button to save clock type 5, the manual mode. You must save clock type 5 before you can advance to the other modes!

5. Increase the clock advance pulse width – If your clock is trying to advance, but doesn't seem to have enough power to advance properly, you may need to lengthen the advance pulse width. To change to increase the clock advance pulse width:

1. Make sure that you are currently in manual clock type mode as outlined in the previous programming example.
2. Press and hold the MODE button. The MODE led will now be blinking once, and the SET led will be blinking 5 times (since you are in the manual clock type).
3. Press the MODE button to advance to mode 2, the clock advance pulse width mode. The MODE led is now blinking twice, and the SET led will be blinking in a way that shows the current value of the clock advance pulse width. Remember that long blinks count as 10 and short blinks count as 1, so if the SET led is blinking 1 long and 1 short the clock advance pulse width will be 11.
4. Press the SET button to increment the count shown on the SET led until the SET led is blinking 5 times.
5. Press and hold the MODE button to save clock type 5, the manual mode. You must save clock type 5 before you can advance to the other modes!

Mode MENU Overview

Mode 1- Set Clock type:

1. Standard Electric, Stromberg
2. International, IBM
3. Gents
4. Late model Stromberg
5. Manual Set-up
6. Brille
7. Solari Udine Flip Clock
8. Western Union Hour Synchronizer
9. Low Voltage Standard Electric, (*Version K2 Firmware*)

Mode 2- Clock Advance Pulse Width:

Mode 3- Clock Advance Voltage:

1 = 24 VDC, 2 = 12 VDC, 3 = 5 VDC

Mode 4- Advance Pulses per minute:

Mode 5- Clock Advance Unipolar or Bipolar Mode:

- 1 = Clock connected between terminal strip pins 1 and 2. Single polarity clock pulse.
2 = Alternating polarity clock pulse. Clock connected between terminal strip pins 2 and 3.
Note: When alternating clock advance polarity is used, hour strike functions are disabled.

Mode 6- Speed Advance:

Speed up clock, each unit is .1 seconds / day (0-99)

Mode 7- Speed Retard:

Slow down clock, each unit is .1 seconds / day (0-99)

Mode 8- Minute Set:

Sets the minutes part of the time of day (0-59)

Mode 9- Hour Set:

Sets the hours part of the time of day (0-23)

Mode 10- Chime Style:

- 1 = Hour strike.
- 2 = Hour + half hour strike.
- 3 = Ships watch strike.
- 4 = Westminster strike (requires optional board).
- 5 = Strike deactivated.

Mode 11- Strike Pulse Width:

Mode 12 – Hour Synchronizer Type:

- 0 = None.
- 1 = IBM A+B Style.
- 2 = Alternating Polarity Synch.
- 3 = Single output at the hour

Mode 13 – Hour Synchronizer Pulse Width (0-65)

Mode 14 – Hour Synchronizer Start Time (0-59)

Mode 15 – Hour Synchronizer End Time (0-59)

Mode 16 – Hour Synchronizer Extra Impulses (0-60)

Mode 17- Low Voltage PWM (0-30) (*Version K2 Firmware*)

This parameter sets the advance pulse output to a PWM mode. A value of 0 set a non PWM mode; this is the normal operation. A value of 1 or greater sets a PWM mode where the advance output duty cycle is defined as $\text{Parameter Value} / 31$. The greater the parameter value the greater the apparent voltage.