In designing the Full Synchronmatic RAPAX Shutter, every consideration was given to the fact that instruments of this type are sometimes subjected to continuous and often hard usage.

Nevertheless, the Full Synchronmatic RAPAX is a highly sensitive instrument, and should be handled carefully... just as you would any valuable timepiece.

★ TO PRE-SET THE SHUTTER

The Full Synchronmatic RAPAX Shutter is a pre-setting type of shutter; before exposure can be made, the shutter must be set or "cocked." This is accomplished by moving the setting lever, extending from the top of the shutter, to the right—the full length of the slot in the dust shield attached to the lever. The shutter is now set, and ready for making the exposure by pressure on the cable release, or by pressing on the release lever located on the left-hand side of the shutter.
TO OPERATE THE SHUTTER WITH OR WITHOUT SYNCHRONIZATION

The markings on the speed dial represent the fractional parts of a second, i.e.: T,

Time; B, Bulb; 1, 1 Sec.; 2, 1/2 Sec.; 5, 1/5 Sec.; 10, 1/10 Sec.; 25, 1/25 Sec.; 50, 1/50 Sec.; 100, 1/100 Sec., etc.

FOR TIME EXPOSURES

"T" or Time Exposure is used for exposures of long duration. Turn the speed cam (the outside knurled disc) until the letter "T" is at the indicating line on the shutter. Set the shutter with the lever on the top, and release by pressure on the lever on the left-hand side of the shutter, or by cable release. This action will cause the blades to open and remain open until the release lever is again tripped (in the same direction) to close the blades. NEVER RESET THE SHUTTER WHEN THE BLADES ARE OPEN; DAMAGE TO THE SHUTTER MAY RESULT.

FOR BULB EXPOSURES

"B" or Bulb Exposure is used also for making prolonged exposures. Set the speed indicator to "B" and set the shutter as outlined above; then trip the release lever or press on the cable release. This will open the shutter and keep it open as long as pressure is maintained. As soon as pressure is released, the shutter will close.

The Full Synchronatic RAPAX Shutter, with built-in synchronization, because of the short, smooth action of the release lever, can be used with any external solenoid or tripper when desired.
FOR INSTANTANEOUS EXPOSURES

Turn the speed cam to the exposure desired, and set the shutter. (When setting to 1/400 sec., a slight additional pressure is required to overcome the resistance of the booster spring.) To release, just press the cable release or release lever on the left side of the shutter. No harm will befall the shutter if the speed indicator is set between any two given markings; but for correct exposures, it is more satisfactory to set the indicator accurately at the desired exposure. Speed of the shutter, if used at intermediate settings, is not guaranteed at those settings.

FOR QUICK GROUND-GLASS FOCUSING

It is not necessary, as with conventional shutters, to change the setting of the speed ring to Time to open the shutter blades, move the ring back to the selected setting after focusing, and recock the shutter before exposing. Leave the speed ring set at the selected speed (any speed from Bulb to 1/400 sec.), merely cock the shutter and depress the Press-focus lever clockwise.

This action will open the blades and keep them open until you have focused.

To close the blades, just lift the Press-focus lever counterclockwise to its original position. Since the shutter has already been cocked, you are ready to trip the release lever for an exposure. Although the shutter must be cocked before using the Press-focus lever it is not necessary to recock the shutter before exposing.

TO OPERATE THE SHUTTER FOR SYNCHRONIZED FLASH

No external synchronizers or solenoids are necessary for flash work with the Full Synchronmatic Rapax.

To permit accurate synchronization of all types of flashlamps with the shutter, a special mechanism called the synchronizer has been built into the shutter. Essentially, the synchronizer consists of a set of electrical contacts which close the circuit to the flashlamp, and a delay mechanism which determines the instant at which the shutter should be open to receive the full benefit of the flash. The split second syn-
chronization of the shutter with a typical 20 millisecond flashlamp is shown in the accompanying illustration.

**OSCILLOGRAPH OF FLASH BULB AND SHUTTER CHARACTERISTICS**

![Oscillograph Image]

On the Full Synchronous RAPAX Shutter all speeds and the delayed action of the synchronizer and the duration of contacts are checked in milliseconds on the GE Time-Interval Meter. The quality of the electrical contacts in the synchronizer is checked on the cathode-ray oscilloscope for accuracy.

The outside curve represents characteristics of the lamp. The inside curve represents shutter characteristic coincidence of peak points to perfect synchronization.

"A"—point of contact, lamp begins to light and reaches maximum or peak illumination at "B." At "C," shutter starts to open, remains fully open, from "D" to "E" and closes at "F." This illustration represents 1/200 second exposure with synchronization at 20 milliseconds. At slower speeds the distance between "D" and "E" becomes longer, although peak illumination "B" remains unchanged.

Both curves were photographed simultaneously with the aid of a cathode-ray oscilloscope.

To connect the shutter with the flash gun or unit, fasten the rectangular end of electrical connecting cord to the connector posts (J) projecting from the lower right-hand side of the shutter, and to the other end of the series outlet in the battery case.

The electrical connector posts protruding from the shutter case are insulated from each other and from the shutter case. Thus
there is no danger of shock when handling the shutter. The Full Synchronmatic Rapax can be safely used with cameras with metal cases and metal shutter boards. Furthermore, it is not necessary to observe polarity when connecting a high speed electronic flash unit to the shutter. The connector cord may be plugged in to the shutter either way.

The Synchronmatic-Rapax has the synchronizer delay mechanism easily adjustable for synchronization with a given class of lamp by merely setting the indicator lever in the notched position opposite the appropriate marking on the delay scale. Note these markings. From left to right on the scale they are: the white "M," the red "M," the white "X," and the white "Off." Also note that the speed markings are in black for 400, 200, and 100. The markings 50 and down through B & T are in red. For most efficient synchronization with Class M (20 m.s.) lamps use the white "M" setting of the synchronizer for the speeds marked in black and use the red "M" setting for the speeds marked in red. If an electronic high speed flash unit of the
Class X type is to be used, set the synchronizer delay lever at "X."
This gives excellent synchronization at all shutter speed settings. If Class F lamps are
to be used, they will be in synchronization at the red speeds of 50 and slower when
the synchronizer is set at the red "F."

To summarize the above in convenient table form:

<table>
<thead>
<tr>
<th>SETTINGS FOR FLASH PICTURES*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>With Speed Setting—</strong></td>
</tr>
<tr>
<td>For Class M (20 m.s.)</td>
</tr>
<tr>
<td>Lamps 50 thru B &amp; T (red)</td>
</tr>
<tr>
<td>For Class X (Electronic Flash)</td>
</tr>
<tr>
<td>For Class F (5 m.s.) (red)</td>
</tr>
</tbody>
</table>

*See last page for explanation of M, F, and X Classifications.

No other adjustment is necessary, before exposing, except to see that the flash lamp
is inserted in the battery case and to cock the shutter. COCKING THE SHUTTER
AUTOMATICALLY COCKS THE SYNCHRONIZER AT ALL SETTINOS OF
THE DELAY INDICATOR EXCEPT IN
THE "OFF" POSITION.
If you wish to operate the Press-focus lever at this point, with the lamp con-
ected to the synchronizer, you may do so without danger of setting off the lamp.
The Press-focus lever opens and closes the shutter blades without sending the shutter
and its synchronization mechanism through
the normal cycle of operation.
The shutter is hand-tripped or released, and automatically synchronizes the peak
flash of the lamp with the maximum shutter
opening. Since built-in synchronization
eliminates the need of external synchro-
nizers or solenoids, the only battery current
needed is to flash the lamp.

**CAUTION:** The time-delay indicator
should be set to the desired position before
setting the shutter; if the shutter is already
cocked before moving the millisecond indi-
cator from OFF position to any other posi-
tion, the synchronization mechanism will not be cocked. In such cases, simply release and then re-cock the shutter.

Should the shutter be cocked with the lamp in place, the time-delay indicator may, if necessary, be moved from Red "M" to White "M" or White "M" to Red "M" but not to the OFF position. If it is moved to an OFF position with the shutter cocked and the lamp in place, the lamp will flash. To make this change in setting, simply remove the lamp from the battery case and then set time-delay indicator to the desired position. If the time-delay lever is at a given setting, it does not require re-setting after each exposure as long as the same type of flash lamp is used.

With the time-delay indicator in the OFF position, no electrical contact is made.

The shutter speeds may be re-set at any time after the shutter is cocked without firing the lamp.

It is recommended that if more than one Class F or Class M lamp is used, additional batteries should be used. Using standard 1.5 volt flashlight cells, the wiring for extension flash lamps, using No. 18 or larger are:

3 cells 15 ft. wire 2 lamps max.
4 cells 25 ft. wire 2 lamps max.
5 cells 50 ft. wire 2 to 3 lamps max.
6 cells 75 ft. wire 2 to 3 lamps max.

BEFORE PUTTING YOUR CAMERA AWAY, IT IS RECOMMENDED THAT YOU RELIEVE THE TENSION ON THE CONTROLLING SPRINGS OF THE SHUTTER BY SETTING THE SHUTTER AT A SLOW SPEED AND TRIPPING.

HERE IS WHAT IS MEANT BY "M", "F", & "X"

There are in common use for between-lens shutters three general types of flash lamps classified according to their "time-to-peak" ratings as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Time-to-peak</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class M</td>
<td>20 milliseconds</td>
<td>G. E. No. 5, 11, 22, Wabash 25, 0, 40 etc.</td>
</tr>
<tr>
<td>Class F</td>
<td>5 milliseconds</td>
<td>G. E. SM Wabash SF</td>
</tr>
<tr>
<td>Class X</td>
<td>0 milliseconds</td>
<td>Electronic high speed: Kodatron, Electroflash</td>
</tr>
</tbody>
</table>
The electronic high speed flash units listed as Class X lamps (also called "0" type, and trigger type) have a gas discharge tube in the trip circuit which acts instantaneously and thus the time-to-peak is listed as 0 milliseconds. There are also some high speed flash units on the market which use a relay in the trip circuit. Since the relay does not act instantaneously, there is a delay or lag between the time the circuit is closed and the time the lamp flashes. This lag is usually adjustable on the flash unit to 5 or 20 milliseconds to synchronize with shutters adjusted for Class F and/or Class M lamps respectively. Because of this time lag they are not classified as Class X, as far as synchronization with a shutter is concerned, even though the speed of the flash itself is about the same for both types of electronic high speed flash units. Typical relay trip units are made by Triumph, Stillman, Wilmar, Everflash, etc.

On all Rapax Shutters, synchronization, shutter speeds, and duration of the internal contact are checked on accurate Time Interval Meters which read directly in thousandths of a second.

The quality of the internal electrical contact closure is checked on the Cathode Ray Oscilloscope. Any chatter or bounce is immediately visible in the trace on the oscilloscope screen.

The shutter opening and closing characteristics are also inspected on the oscilloscope, giving a clear and accurate picture of the shutter blade movement throughout the operational cycle. Thus the shutter efficiency is determined and any binding of the blades can be quickly detected.

DON'T

DON'T use oil on the shutter. Special greases have been applied, making it unnecessary to use any additional lubricants. Oil will ruin the shutter.

DON'T use graphite. If the shutter seems sluggish, it may be the result of continuous wear, extreme atmospheric conditions, or undue exposure to dust. Should dust settle on the mechanism, use a soft camel hair brush to remove same, or blow the dust off with a rubber syringe bulb.
Guarantee

This shutter is warranted to give perfect satisfaction. If with proper care it fails to give satisfaction within two years after leaving our factory, repairs will be made free of charge.