

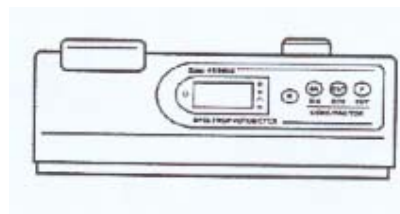
Teysche™ 400 SERIES

Spectrophotometer

Model

Teysche™ 100

Teysche™ 400



USER'S MANUAL

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INTRODUCTION:

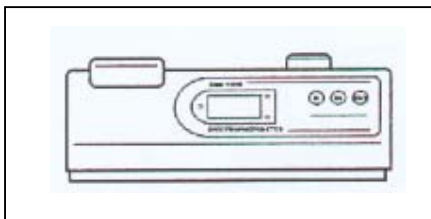
Thank you for your purchase of **Teysche 400** series spectrophotometers.

The **Teysche 400** series are single beam spectrophotometers. It's large LCD digital display, easy operation, and wide wavelength range make instruments idea for spectrophotometer experiments in the visible wavelength region of electromagnetic spectrum.

The **Teysche 400** series spectrophotometers are general-purpose instruments designed for use in convention laboratories. The instruments are ideal for various applications such as Clinical chemistry, Biochemistry, Petrochemistry, Environmental Protection, Food and Beverage labs, Water and Waste labs and other fields of Quality control.

The **Teysche 400** Series spectrophotometers are available in two models. The major differences among these instruments involve the digital display, some specifications and some operation method.

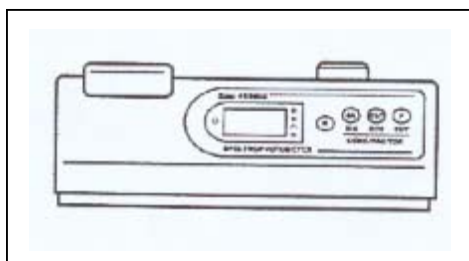
Model Teysche 100: is a basic spectrophotometer with an overall wavelength range of 330nm to 1000nm. The instrument is designed to meet the needs of both students and instructors.



Model **Teysche 100** Spectrophotometer

Model Teysche 400: is a high quality, low cost spectrophotometer with a large 3.5 LCD digital display and an overall wavelength range of 330nm to 1000nm. The built-in **RS-232C** interface enables the instruments to be connected to a computer or printer.

Figure 2



Teysche 400 Spectrophotometer

This user's manual provides information of **Teysche 400** Spectrophotometer series of spectrophotometers, a list of main specifications, and available accessories.

After carefully unpacking the content, check the materials against the packing list to ensure that you have received everything in good condition. If you find part is missing damaged or any other defect, contact you dealer or **Teysche** sales representative immediately.

However, to keep pace with technological advance, the specifications and operating instructions may be modified or changed as needed. **Teysche** reserves the right to make design modification and changes.

WORKING PRINCIPLE:

The **Teysche 400** Series spectrophotometers consists of six parts:

Light source : a tungsten halogen lamp to supply the light, which emits light in the wavelength range 330-1000nm.

Monochromator : to isolate the wavelength of interest and eliminate the unwanted second order radiation.

Sample compartment : to accommodate the sample solution.

Detector : converts the light transmitted through the test sample into electric current.

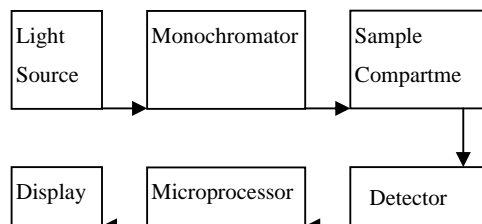
Microprocessor : converts the electric signal into a digital reading using the characteristic data for the respective test.

Display : display of results in absorbance or transmittance or concentration (**Teysche 400** only).

In your **Teysche 400** series spectrophotometer, light from the lamp is focused on the entrance slit and passes into the monochromator, where the grating disperses the light beam to produce the spectrum, a portion of which is focused onto the exit slit by the collimating mirror. From here the beam is passed to a sample compartment through one of filters which help eliminate unwanted second order radiation from the diffraction grating. Upon leaving that sample compartment, the beam is passed to the silicon photodiode and causes the detector to produce an electric signal is displayed.

Teysche 100 spectrophotometer incorporates a special analog output terminal that can be used to interface these spectrophotometers with a chart recorder, or with any computer interface that can accept a signal that varies from 0-3Volts DC.

Figure 3




Block diagram for the **Teysche 400** series Spectrophotometer

SPECIFICATIONS :

Table 1

Model	Teysche 100	Teysche 400
Wavelength range	330-1000nm	330-1000nm
Spectral slit width	6nm	
Wavelength accuracy	± 2 nm	
Wavelength readability	± 1 nm	
Stray radiant energy	Less than 0.3% T at 340nm, at 400nm	Less than 0.3% T at 340nm, at 400nm
Transmittance	0% to 125.0% T	0% to 125.0% T
Absorbency	0A to 1.999	0A to 1.999A
Concentration	—	0-1999C (0-1999F)
Photometric accuracy	$\pm 1.0\%$ T	$\pm 1.0\%$ T
Power requirement	80-264volt, 50-60Hz automatic	
Size (Width x Height x Depth, mm)	316 x 105 x 280	
Weight	4.5kg	


UNPACKING INSTRUCTION :


 Carefully unpack the contents and check the materials against following packing list to ensure that you have received everything in good condition.


**Packing List
For
Teysche 400 Series
Spectrophotometer**

Table 2

Description	Quantity
Spectrophotometer	1 set
Square Cuvettes	1 box(pk of 2)
Dust cover	1 pc
User's manual	1 book

 Place the instrument in suitable location. In order to have the best performance from your instrument. Keep it as far as possible from any strong magnetic or electric fields, or any electrical device that may generate high frequency fields. Set the unit up in an area that is free of dust, corrosive gases, and strong vibration.

 Remove any obstructions or materials that could hinder the flow of air under and around the instrument vibration.

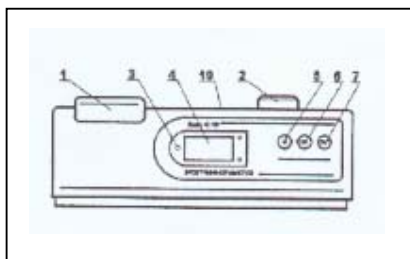
 Plug the power cord into an outlet. Turn on the instrument and allow it to warm up for 15 minutes before taking any readings.

Your spectrophotometer is now ready for operation.

KEY COMPONENTS:

The key operating components of the **Teysche 400** series spectrophotometers are shown in the figure 3 and figure 4. The Power Switch is located on the

Figure 4



Key components of the Teysche 100 Spectrophotometer

back of the instrument as shown in Figure 5, The main controls for routine operation are Wavelength Control, Digital Display, Mode select control and auto 0A/100%T control etc.

1 SAMPLE COMPARTMENT:

holds the cuvette containing your reference or sample solution.

2 WAVELENGTH CONTROL:

is used to select desired the analytical wavelength.

3 POWER ON/OFF INDICATOR:

indicates whether the instrument is on or off.

4 LCD DIGITAL READOUT:

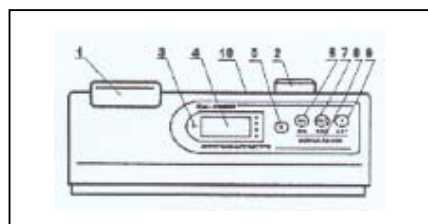
displays the data of Transmittance, Absorbance, Concentration and Factor (Model **Teysche 400** only).

There are four red LED status indicators that are labeled Transmittance, Absorbance, and Concentration Factors(Model **Teysche 400** only) indicate the currently active mode.

5 MODE SELECTOR KEY:

selects the Transmittance, Absorbance, Concentration or Factor (Model **Teysche 400** only) mode.

Figure 5



Key components of the Teysche 400 Spectrophotometer

6 100% T/0A CONTROL KEY:

is used to set the display to 0A or 100%T. It must be reset whenever the analytical wavelength has been changed.

Note :When operating at a fixed wavelength for an extended period of time, check the 0%T and 100%T readout and readjust if necessary

7 0%T CONTROL KEY:

is used to set display to 0%T before setting 0Abs.

Note: It must be reset whenever the analytical wavelength has been changed.

8 PRINT BUTTON: (**Teysche 400** only): to send displayed data to a printer or computer connected to the **RS-232C** serial port.

9 CONCENTRATION/FACTOR KEYS: (**Teysche 400** only) are used in concentration mode to set concentration or factor value of a know standard on the digital display.

10 WAVELENGTH READOUT WINDOW: (next to the wavelength control knob): shows the wavelength scale. All gradations are in 2 nm internal.

11 RS-232C PORT: (**Teysche 400** only): located on the back of the instrument. The pin functions for the connector are listed below:

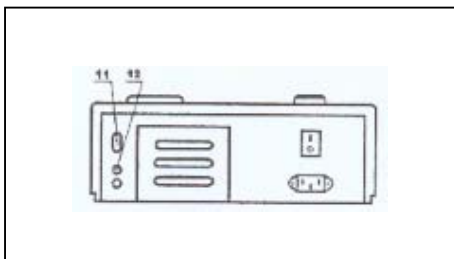
- 1-Chassis ground;
- 2-Ssico transmits data;
- 3-Ssico receive data;
- 7-Signal ground.

The RS-232C parameters is:

- Baud rate-9600
- Data bit-8
- Stop bit-1
- Parity-none

12 ANALOG OUTPUT: connector is a double-banana socket located on the back of instrument.

Figure 6



Key components of the **Teysche 400** series Spectrophotometers

OPERATING PROCEDURES

1.-Plug the instrument into a grounded outlet.

2.-Turn the instrument on. Allow the instrument to warm up for at least 15 minutes.

3.-Select the analytical wavelength by turning the **Wavelength** control knob.

For example if your analytical wavelength is 657.9nm, move the wavelength dial by the wavelength control knob and set at 658nm.

4.-Select the desired operating mode as Transmittance, Absorbance, or Concentration (**Teysche 400** only) by pressing the **Mode** Selector.

5.-Choose matched cuvettes of appropriate pathlength for analytical method you are using. You have to use same pathlength cuvette for all blanks, standards and samples.

Note: All of cuvettes supplied with your instrument are 10mm pathlength and have been mated. Glass cuvettes are useable above 320nm only.

6.-Fill one of the matched cuvettes with water or other blank solution.

7.-Open the sample compartment, then place the cuvette with water or blank solution in the well of the cuvette holder.

Note: Solution must be at least 20mm high in a standard square cuvette.

8.-Close the sample compartment cover, set blank by pressing the **0Abs/100%T** Key until display reads 100.0%T or 0.000A.

9.-Remove the cuvette from sample compartment.

10.-Place the cuvette with solution to be measured in the well of the cuvette holder, then read the % Trans or Abs. value of the sample.

11.-Remove the cuvette from sample compartment.

12.-Repeat step 10. to 12. For any additional samples.

ABSORBANCE OR TRANSMITTANCE OPERATING MODE

13.-Press **MODE** selector key to the appropriate mode.

14.-Construct a standard curve by plotting Absorbance/% Transmittance on the y-axis and the concentration of each standard on the x-axis.

15.-Determine the concentration of each sample by finding its data value on the y-axis and reading the correspond concentration value off the x-axis.

16.-Correct for any sample blank or interference effects as necessary.

CONCENTRATION MODE

(Teysche 400 only)

Note: This mode is used only if the linearity of the standard curve has been verified.

--Using in C/Standard mode:

13. - Press **Mode** selector key until the LED under the **A** is lit.

14. - Place the blank solution in the sample compartment, then close the sample compartment cover.

15. - Press the **100%T/0A** control key to zero the blank solution.

16. - Remove the blank solution from the sample compartment cover.

17. - Press the **MODE** selector key until the LED under the **C** is lit.

18.- Using the **INC.** or **DEC.** of **CONC/FACTOR** keys to setting the concentration of the standard on the digital display, then press the **ENT** key.

19. - Insert the sample solution to be measured into the curvette holder. Close the sample compartment cover, read results directly in concentration units on

the digital display.

-Using in C/Factor mode:

13. - Press **MODE** selector key until the LED under the **A** is lit.

14. - Place the blank solution in the sample compartment, then close the sample compartment cover.

15. - Press the **100%T/0A** control key to zero the blank solution.

16. - Insert the standard solution in the sample compartment.

17. - Press the **MODE** selector key until the LED under the **F** is lit.

18.- Using the **INC.** or **DEC.** of **CONC/FACTOR** keys to setting the concentration of the standard on the digital display, then press the **ENT** key.

19. - Remove the standard solution from the sample compartment cover.

20. - Insert the sample solution to be measured into the cuvette holder. Close the sample compartment cover, read results directly in concentration units on the digital display.

MAINTENANCE:

This **Teysche 400** series spectrophotometer has been designed to be durable and reliable. Therefore, the routine maintenance of the instrument is minimal.

However, you will need to replace the lamp or you may want check the wavelength calibration and photometric linearity to verify the instrument's performance.

Warning

The manufacturer recommends only authorized service representatives perform procedures requiring removal of the instrument's cover and replacement of electrical components. To protect both of yourself and your instruments, be sure to contact **Teysche** authorized service representative to perform any service procedure you do not feel comfortable performing.

TO REPLACE HALOGEN BULB

- 1.- Turn off the power and unplug the instrument.
- 2.- Remove the two screws on the back side of the instrument.
3. - Remove the lamp from lamp holder
4. - Carefully replace the new lamp.

Note: Do not handle Halogen lamp with bare finger. Use a piece of tissue or cloth when handling the lamp. The oil from your fingers can cause the lamp to burn out prematurely!

WAVELENGTH CALIBRATION:

As usual the **Teysche 400** series spectrophotometer retains its wavelength calibration indefinitely. However if the instrument receives a severe shock or is abused, use the following methods to check the wavelength calibration.

In the Didymium filter method, the filter has two special absorbance peaks at the 529nm and the 808nm, when the instrument is calibrated properly, you will find minimum Transmittance (maximum absorbance) at the range of 529nm (or 808nm) ± 2 nm.

Note: that the specific transmittance values are not important, you are only looking for the wavelength where minimum transmittance (maximum absorbance) occurs.

1. - Turn on your instrument and allow it to warm up for 20 minutes.
2. - Select the %Transmittance operating mode by press the **MODE** key.
3. - Set the wavelength to 519nm.

Teysche 400 Series spectrophotometer

4. - Insert the cuvette filled with distilled water in the well of the cuvette holder.

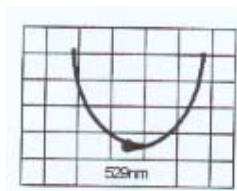
5. - Pressing the **0Abs/100%T** Key until display reads 100.0%T or 0.000A, then remove the cuvette with water.

6. - Insert the didymium filter in the well of the cuvette holder, record the %T reading on the digital display.

7. - Repeat steps 3. Through 6. to measure separately the wavelength of the point between 519nm and 539nm.

8. - Looking for the minimum %Transmittance along this record, the minimum %Transmittance should be obtained between 526nm and 532nm. The wavelength accuracy of the **Teysche 400** series spectrophotometers is $\pm 2\text{nm}$.

Figure 7



Check the wavelength calibration
With Didymium Filter

TROUBLESHOOTING :

Problem	Possible cause/ Remedy
<p>? Instrument inoperative</p>	<ul style="list-style-type: none"> ✘ - Power cord not connected to outlet/Plug instrument in. ✘ - Dead power output/change to different output. ✘ - Internal fuse blown or defective electronic component/Call an authorized service engineer.
<p>? Instrument cannot set 100.0% T(0.000A)</p>	<ul style="list-style-type: none"> ✘ - Light beam blocked/Open the sample compartment cover, make sure that the sample compartment is empty. ✘ - Lamp old or defective/replace with a new lamp refer to lamp replacement instructions in this manual. ✘ - Defective electronic component/Call an authorized service representative.
<p>? Display shows "125.0" or "125" in %T, and shows "0.097" or "0.1" in Abs.</p>	<ul style="list-style-type: none"> ✘ - Check the sample compartment lid is closed or not, make sure that the lid is closed. ✘ - Press 100%T/0A key until display on scale. ✘ - Turn the wavelength to low energy region, then check the bulb, if it is not down from bright to dark when press the 100%T/0A key, call an authorized representative.
<p>? T% can not set to 0.00% T.</p>	<ul style="list-style-type: none"> ✘ - Defective electronic component or light leaks around detector access cover/call an authorized service representative. ✘ - Detector is dirty or defective or amplifier is defective/call an authorized service representative. ✘ - Sample compartment is not securely seated in the instrument ✘ - LCD Digital display is defective/call an authorized service representative. ✘ - Main PC board is defective/call an authorized service representative.

<p>? Digital display does not change regardless of sample concentration</p>	<ul style="list-style-type: none"> ✘ -Wrong wavelength setting/Check the sample procedure and wavelength setting. ✘ - Insufficient sample volume/Fill cuvette with more sample. ✘ -Stray sample preparation vapors/prepare sample away from instruments, use proper ventilation. ✘ -Bubbles or particles in solution/Check sample preparation and analytical procedure.
<p>? Display show “00.0” or “000.0” in %T mode or “1.XX”in Abs. mode (where “XX” are two blank digital.)</p>	<ul style="list-style-type: none"> ✘ - Check the bulb, if it is not lit, replace the bulb. ✘ - Open the lid of sample compartment, make sure nothing blocks in the light path. ✘ - Check the display, is it changes when you open and close the lid. If the display doesn't change, Either the detector or the main PC board needs to be replaced. ✘ - Check the display, is it changes when you open and close the lid. If the display does change, check the light beam with the following steps: <ul style="list-style-type: none"> ● Set the wavelength to 580nm. ● Place a long strip of white paper into sample compartment, you should see a yellowish light from the bottom of the paper coming from the right side of the sample compartment. If you don't see any light at all, the internal optical Path is blocked in some way /Call an authorized service representative. If you see light , perhaps the cable from the detector to the main PC board is disconnected/Call an authorized service representative.
<p>? Nothing at all appears on the display</p>	<ul style="list-style-type: none"> ✘ - Check the power indicative lamp. If it is not lit: <ul style="list-style-type: none"> - Power cable not plugged. - Power switch on unit is off or defective. - Power cable is defective. - Fuse is blown. ✘ - Power supply PC board is defective. ✘ - Internal switch power supply or transformer is defective.

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	<p>✘ - Internal wiring connections are bad.</p> <p>All above defectives call Teysche authorized service representatives near your city.</p>
? Bulb is lit, but no display at all	<p>✘ - Internal connection between the digital display PC board and the power supply PC board is bad.</p> <p>✘ - Power supply board is defective.</p> <p>✘ - Digital display PC board is defective.</p> <p>All above defectives call Teysche authorized service representatives near your city.</p>
? Instrument drift and noise	<p>✘ - Check your application, procedure and sampling technique.</p> <p>✘ - Bubbles or particles in solution/Check sample preparation and analytical procedure.</p> <p>✘ - Fumes from sample are affecting the optics of the instrument/Open the cover of sample compartment</p> <p>✘ - Lamp old or defective/replace new lamp.</p> <p>✘ - Defective or dirty detector or defective electronic component/call an authorized service representative.</p> <p>✘ - Power in the line is fluctuating/Using a stability power supplier.</p> <p>✘ - Instrument is not grounded properly.</p> <p>✘ - Line voltage is incorrect.</p> <p>8. Main PC board is defective.</p>
? Incorrect reading obtain	<p>✘ - Insufficient sample value/Fill cuvette with greater sample value.</p> <p>✘ - Wrong wavelength setting/Check analytical procedure and wavelength setting.</p> <p>✘ - Stray sample preparation vapors/prepare sample away from instrument, use proper ventilation.</p> <p>✘ - Bubbles or particles in solution/Check sample</p>

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	<p>preparation and analytical procedure.</p> <p><input checked="" type="checkbox"/> - Instrument out of electronic calibration/Call an authorized service representative.</p>
<p><input type="checkbox"/> Reading are not repeatable</p>	<p><input checked="" type="checkbox"/> - Check that the wavelength and 100%T is set correctly.</p> <p><input checked="" type="checkbox"/> - Is there any bubbles and degassing in your sample.</p> <p><input checked="" type="checkbox"/> - Make sure that test tube or cuvette is clean or not.</p> <p><input checked="" type="checkbox"/> - Tubes are not aligned in exactly the same position for each reading.</p> <p><input checked="" type="checkbox"/> - Sample compartment cover is not securely seated in the instrument</p> <p><input checked="" type="checkbox"/> - Cuvette holder is not securely seated in the instrument.</p> <p><input checked="" type="checkbox"/> - Diameter of tube may be too small for snug fit the sample compartment.</p>
<p><input type="checkbox"/> Data cannot be sent to computer or printer</p>	<p><input checked="" type="checkbox"/> - Disconnected cable/connect cable</p> <p><input checked="" type="checkbox"/> - Defective electronic component/Call an authorized service representative.</p>