Macbeth®
A division of
Kollmorgen Corporation

Transmission Densitometer TD-504

Operator's Manual

CHANGE NO. 1

DATE 8/17/72

INSTRUCTION BOOK CHANGE NOTICE

MANUAL AFFECTED TD-504 Operator's Manual (ISSUE DATE: Mar., 1972)

Page 4-3. Table 4-2. FUSE REPLACEMENT DATA

Change the entry for fuse F402 to read:

FUSE	RATING	DESCRIPTION
F402	1/4 amp, 250V	Same as above (Macbeth Part #31002001)

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OPERATOR'S MANUAL
FOR
TRANSMISSION DENSITOMETER, MODEL TD-504

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Kollmorgen Corporation

PRICE:
$5.00

REVISED
FEB. 1973

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SECTION 1

GENERAL INFORMATION

1-1 GENERAL DESCRIPTION

The TD-504 is an all-new, digital-readout, transmission densitometer equipped with four selectable filters for color—and visual—density measurements within a range of 0 to 4.0. The TD-504 is designed to accept different sets of filters in order to fulfill various operating requirements (see paragraph 1-2). Push-button controls and digital density display offer the utmost in operating ease while making it possible to obtain immediate, accurate, and reproducible density measurements with a minimum of operating errors. Instrument zeroing in each filter position is instantaneous and is accomplished without control adjustments. Readings taken with the TD-504 indicate American Standard (ANSI*) opal-glass, diffuse visual transmission density. Instruments for measuring projection density are available on special order.

Additionally, the TD-504 features built-in interfacing capabilities that facilitate transmittal (via BCD signals) of density readings and filter-identification data to a remote print-out device.

1-2 APPLICATIONS

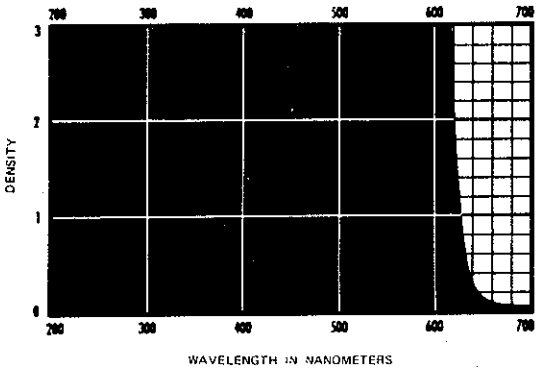
The TD-504 has application in areas where the measurement of diffuse color and visual transmission density within the 0 to 4.0 range is critical for establishing and/or insuring consistent product quality. Typical examples of such applications are:

TYPICAL APPLICATIONS

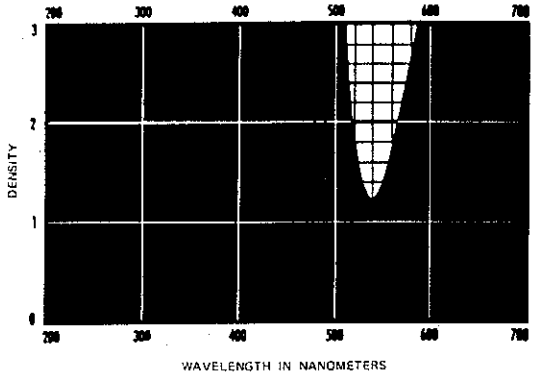
MODEL NO.	FILTERS	APPLICATION
TD-504	Wratten Gelatin (See figure 1-2)	General usage.
TD-504A	Kodak Status A** (See figure 1-2)	For reversal color films intended for viewing.
TD-504M	Kodak Status M** (See figure 1-2)	For color film intended to be printed.
TD-504 AM	Kodak Status A** & M**	Same as for Status A and M above.

**American National Standards Institute (formerly ASA).*

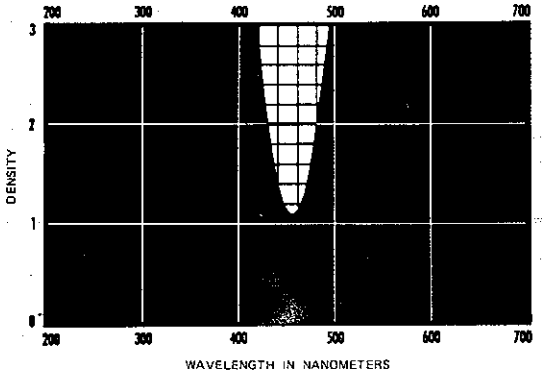
***Status filters are carefully selected and calibrated to conform to close spectral tolerances. Each status filter is enclosed in a cemented-glass envelope that protects its surface against abrasion and minimizes fading. Additional information pertaining to these filters and their care is contained in a separate sheet: "About Your Filters," provided with each instrument that is shipped from the factory with status filters.*



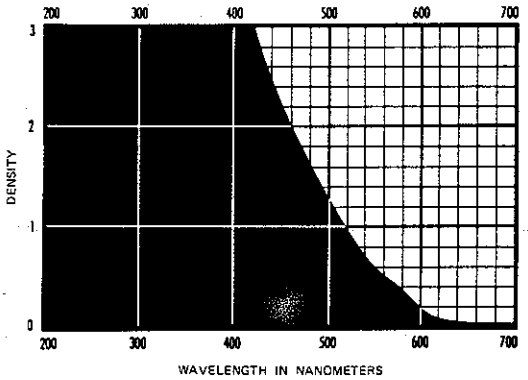
92 – Red – (TD-504)



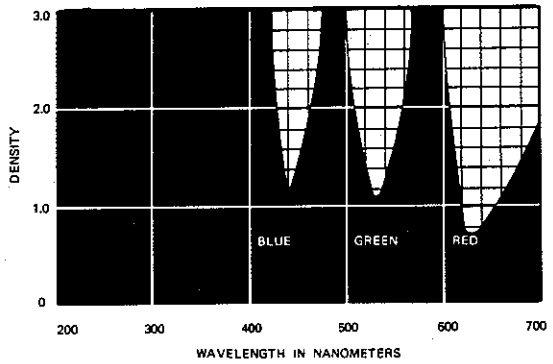
93 – Green – (TD-504)



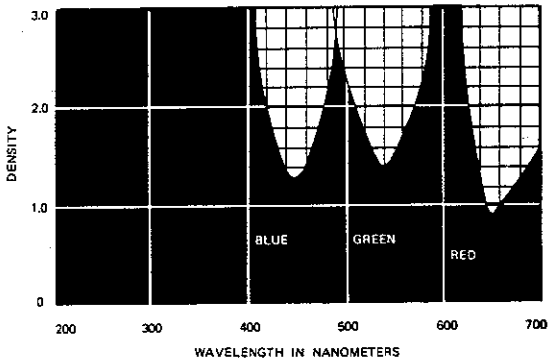
94 – Blue – (TD-504)



106 – Visual – (TD-504/A/M)



Status A – (TD-504A)



Status M – (TD-504M)

Figure 1-2. Filter Characteristics, TD-504

1-3 ITEMS/ACCESSORIES SUPPLIED

The following items/accessories are supplied with the TD-504.

a. One operator's manual.

b. Warranty statement.

c. Simplified operating instructions.

d. One calibrated step tablet (0 to 4.0 density range).

e. One stage diffuser containing a 1-mm (0.0394 inch) reading area insert.

f. One stage diffuser containing a 3-mm (0.1181 inch) reading area insert.

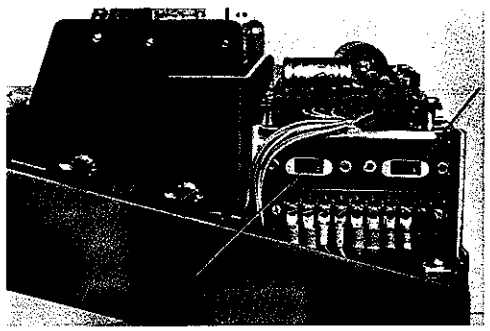
g. One extra light source.

SECTION 2

INSTALLATION

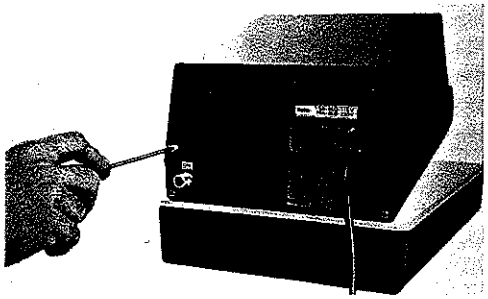
2-1 OPERATING VOLTAGE

The TD-504 has been designed for operation at 115 or 230 volts (nominal), at powerline frequencies of 50 and 60 Hz. Change from 115-volt to 230-volt operation (or vice versa) is accomplished by a clearly-marked selector switch located on the side of the power supply bracket. With this switch set at 115 and the HI/LOW switch set at HI, the instrument will operate with input voltages in the 110- to 130-vac range. With the 115/230 switch set at 230 and the HI/LOW switch set at HI, the instrument will operate with input voltages in the 220- to 260-vac range. If the instrument is to be operated at voltages lower than 110 vac (as low as 90 vac) or lower than 220 vac (as low as 180 vac), the HI/LOW switch must be set at LOW.

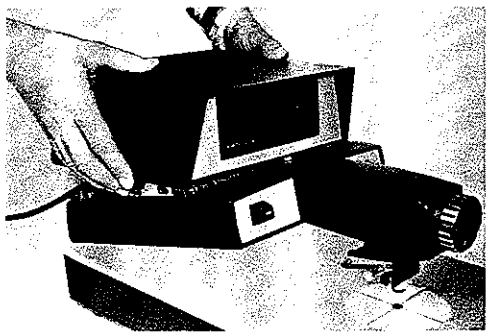


Access to the 115/230 switch and to the HI/LOW switch is obtained by removing the instrument cover:

SEE
ADDENDUM #1



a. Loosen and remove two cover-retaining screws.



b. Lift cover slightly upwards and backwards so that locking flanges on front of cover clear the instrument housing.

2-2 VOLTAGE REGULATION

The electronic power supply of the TD-504 is self-regulated and hence is not affected by normal line-voltage variations. Light source stabilization is accomplished via a silicon cell pick up and integrating feedback principle. An external voltage regulator is not required.

2-3 POWER CONSUMPTION

Total power consumption of the TD-504 is approximately 70 watts; this includes the power required to operate the electronic circuits and the optical system light source.

2-4 CONNECTING TD-504 TO AUXILIARY PRINT-OUT DEVICE

With minor equipment modifications, density readings and filter-identification data can be transmitted (via BCD output signals) to auxiliary print-out equipment. This feature is optional, and complete instructions for modifying the TD-504 are given in the "BCD Output Kit #59000100."

NOTE

Input-signal connections for the auxiliary print-out device are unique to the specific equipment used. Information regarding these connections must be obtained from the appropriate manufacturer.

SECTION 3

OPERATING INSTRUCTIONS

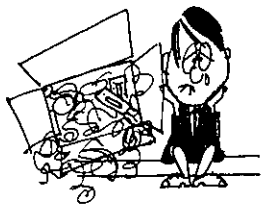
3-1 PRELIMINARY CONSIDERATIONS

a. Ventilation

The TD-504 is fan-cooled; air intake and exhaust is accomplished through vents located in the instrument base.

IMPORTANT

To insure adequate ventilation, air flow around the base of the instrument must not be restricted during operation.

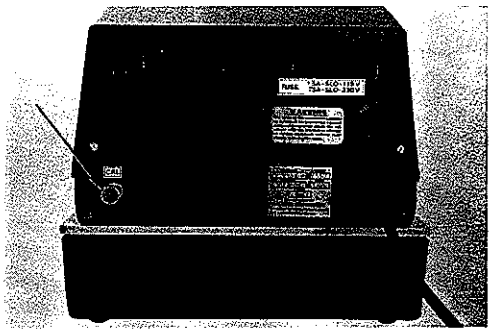


b. Ambient Illumination

The TD-504 can be operated under all normal conditions of ambient illumination; its performance is unaffected by operation in brightly-illuminated or in darkened areas.

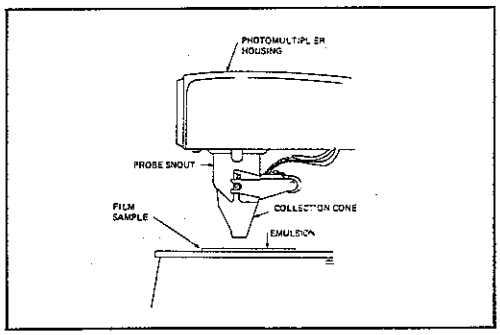
c. Periodic Calibration Checks

Since the TD-504 is a manually-operated and manually-calibrated instrument, it is recommended that the CAL control setting be checked periodically during the day and adjusted whenever necessary to insure that the instrument is performing properly.



d. Evaluating Photographic Film

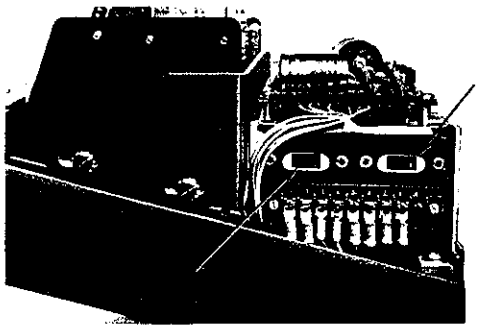
When density measurements are to be performed on photographic films, the emulsion side of the sample should face upwards (i.e., towards the collection cone.



e. Null Balance Capability

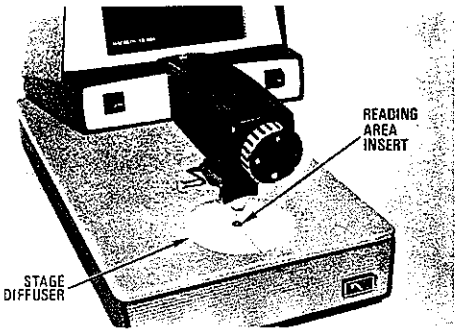
The TD-504 has the capability of reading density differences without operator computations. This is accomplished by zeroing the instrument with a desired density sample over the reading area insert (this can be done for each filter position). Density display of measured samples will now be in terms of plus- or minus-deviations from the known sample.

3-2 OPERATING PROCEDURE

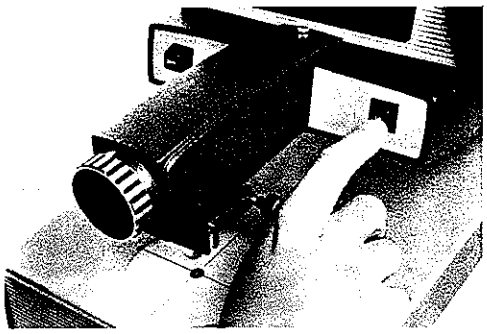


a. Insure that 115/230 switch and HI/LOW switch are set at proper positions for available input voltage (see paragraph 2-1).

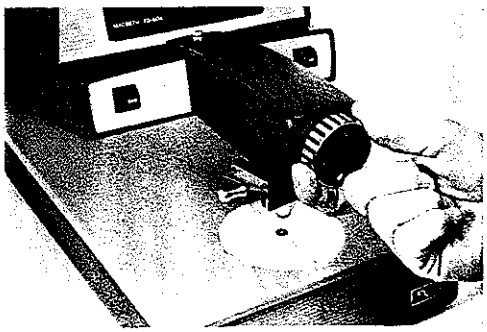
SEE
ADDENDUM #1



b. Make certain that reading area insert is of proper size for sample being measured (refer to paragraph 3-3).

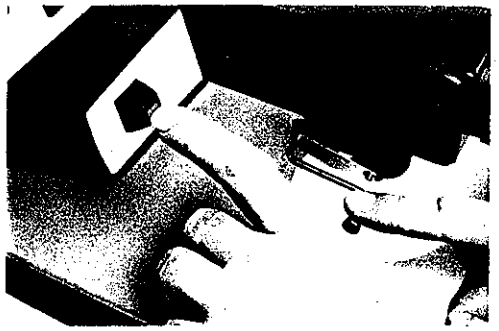


c. Turn instrument on by momentarily pushing ON pushbutton. Instrument is ready for service immediately; no warm-up time is required.

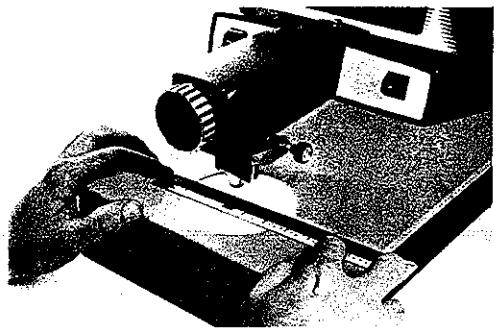


d. Rotate Filter Selector to visual (Gold) filter position.

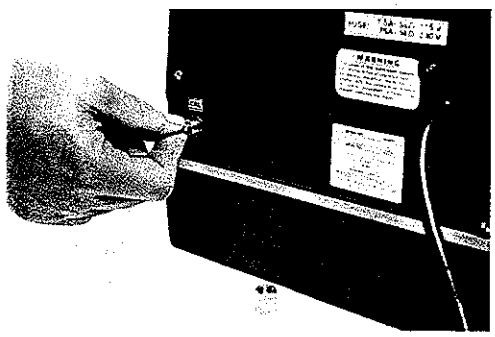
e. With no sample over reading area insert, depress Snout Lever and momentarily push ZERO pushbutton.



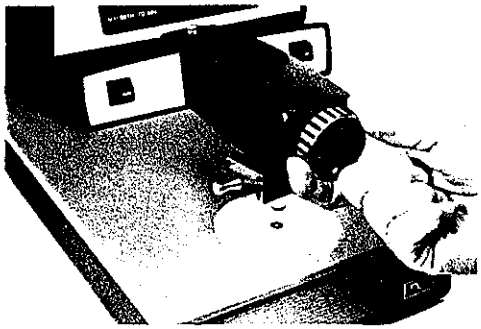
f. Place calibrated step tablet on illuminated stage disc; position step tablet so that "Calib." step is directly over reading area insert.

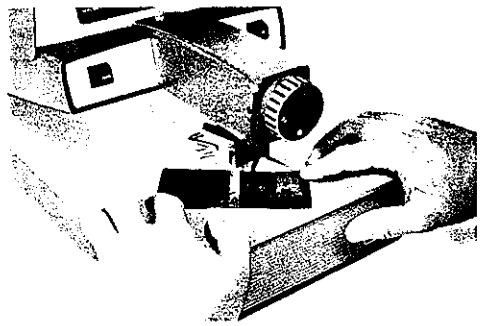


g. Depress Snout Lever and observe digital display. Adjust CAL potentiometer on back of instrument until digital display corresponds with density value for "Calib." step (as noted on step tablet). Remove calibrated step tablet.

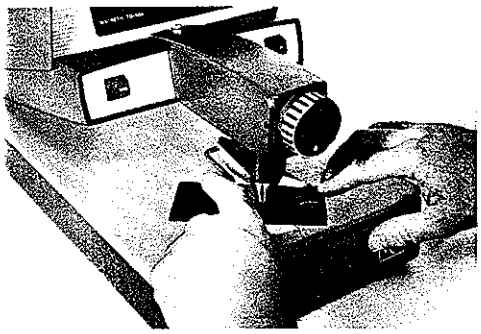


h. Repeat steps d and e above for each of remaining filter positions.



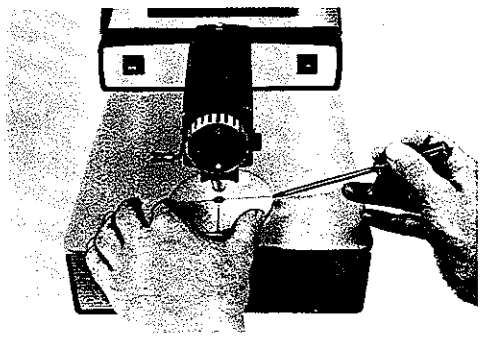


i. Rotate Filter Selector to desired filter position; place sample to be measured over reading area insert; depress Snout Lever and read measured density on digital display.



3-3 CHANGING READING-AREA INSERTS

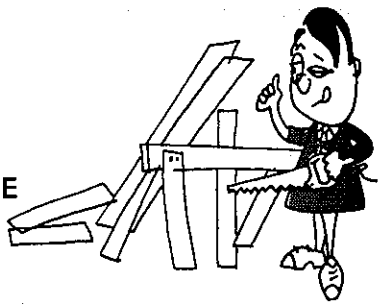
Because it is more frequently used, the 2-mm reading-area insert is installed in the TD-504 when it is shipped from the factory. This insert can be replaced with a 1-mm or 3-mm insert (provided as accessory items) in order to read smaller or larger areas respectively.



a. Using small screwdriver, carefully lift circular stage diffuser from stage base.

b. Set light-source attenuation filter at proper position for new reading area insert.

c. Replace circular stage diffuser (complete with new reading-area insert) in stage base of instrument. Note that the diffuser is key-fitted to its receptacle in the stage base and will seat properly in one position only.



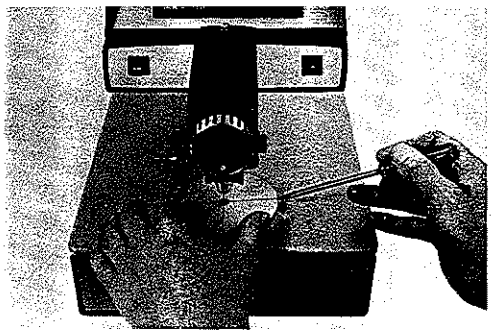
SECTION 4

OPERATOR'S MAINTENANCE

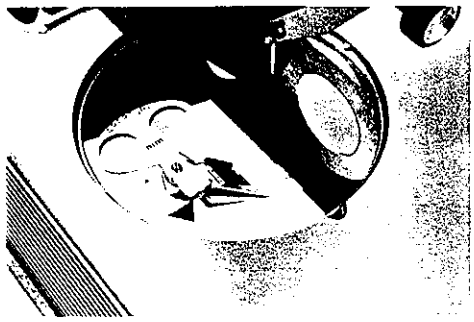
4-1 INSPECTION AND CLEANING

Dust, dirt, moisture, and other destructive environmental elements can contribute to equipment malfunction; therefore, the TD-504 optical system should be inspected and cleaned periodically. The frequency of this inspection and cleaning should, of course, be dependent upon: (1) frequency of instrument usage; (2) environmental operating conditions. A camel-hair brush or lens tissue should be used for cleaning.

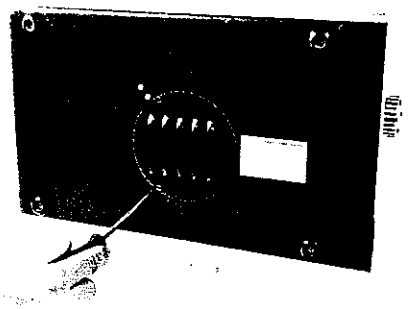
a. Make certain that a-c input power is disconnected from TD-504.



b. Remove circular stage diffuser from stage base (see paragraph 3-3) and inspect reading area insert for accumulation of dust or dirt.



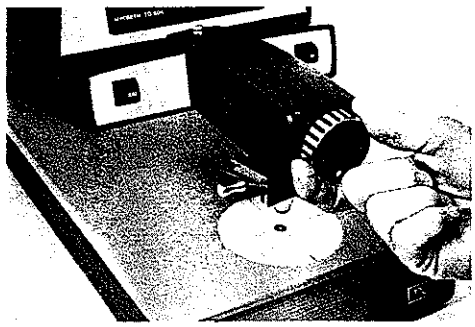
c. Inspect light-attenuating filters, folding mirror and imaging lens for accumulation of dust or dirt and for possible damage such as cracks or scratches.



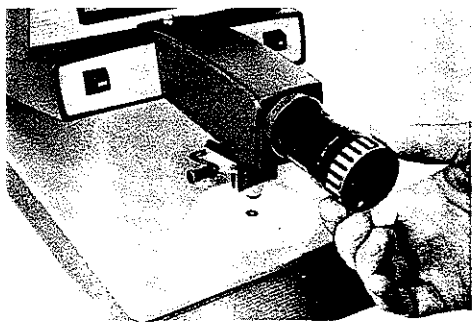
d. Remove circular access plate from stage base and inspect light source and reflector for possible accumulation of dust, dirt or grease (see note below).

NOTE

If the light source is touched with bare fingers, it must be cleaned with ispropyl alcohol before a-c power is applied to the TD-504.



e. Remove filter turret by rotating Filter Selector 45° in any direction to get it off detents and pull turret out by hand. Turret is held by spring-loaded detent mechanism and requires no tools for removal.



f. Inspect filters for cracks or dirt.

g. Clean filters with soft tissue such as lens tissue.

h. Replace filter turret, access plate, and circular stage diffuser.

4-2 FUSE REPLACEMENT

CAUTION

Disconnect a-c input power before attempting to replace fuses.

There are two fuses employed in the TD-504; (1) fuse F401 located on the rear chassis panel of the instrument; (2) fuse F402 located on the printed circuit board for the power supply. No special instructions are required to replace either fuse; however, in order to gain access to fuse F402, it is necessary to first remove the instrument cover (refer to steps "a" and "b" of paragraph 2-2). Indications of a burned out fuse are given in table 4-1; replacement fuses must comply with the information given in table 4-2.

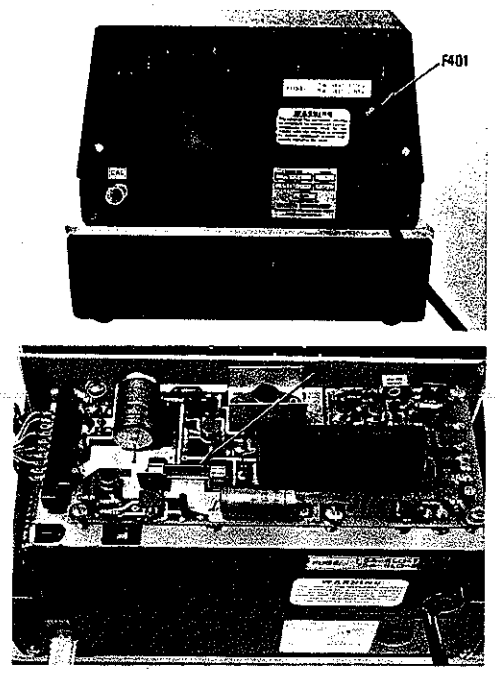


TABLE 4-1. BURNED-OUT FUSE INDICATIONS

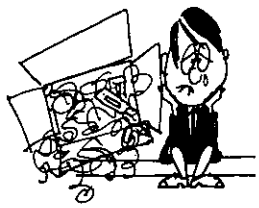
INDICATION	FUSE
Instrument is *in*operative	F401
Optical light source is bright and digital display indicates 8.88	F402

TABLE 4-2. FUSE-REPLACEMENT DATA

FUSE	RATING	DESCRIPTION
F401		
100 vac Operation	1½ amp, 250 V	#3AG, ¼ in (6mm) x 1¼ in (32mm), cartridge, Slo-Blo (Macbeth Part #31015000)
115 vac Operation	Same as for 100 vac operation	Same as for 100 vac operation
230 vac Operation	¾ amp, 250 V	Same as above (Macbeth Part #31007000)
F402		
	¼ amp, 250 V	Same as above (Macbeth Part #31002001)

CAUTION

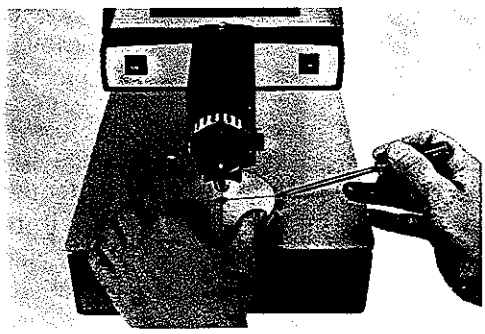
Do not replace a fuse with one of higher rating. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been located and corrected.



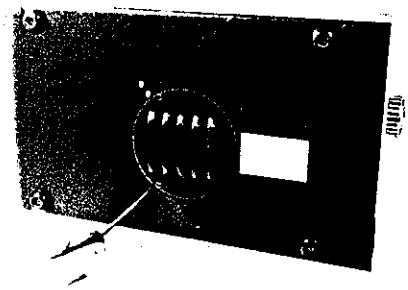
4-3 LIGHT SOURCE REPLACEMENT

A spare lamp for the optical system is provided as an accessory item with the TD-504 and is contained in the instrument base. If additional lamps (part number 30950000) are required, they should be obtained from your authorized Macbeth dealer or directly from the Macbeth Division, Kollmorgen Corporation, Newburgh, N.Y. 12550.

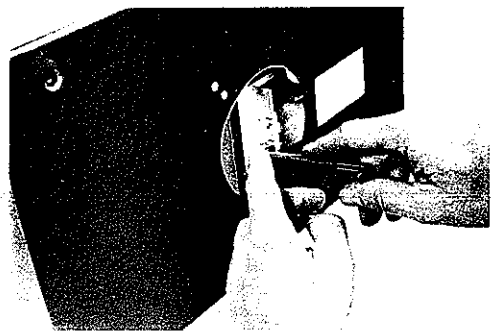
a. Ensure that a-c input power is disconnected from instrument. Remove circular stage diffuser from stage base and set diffuser aside.



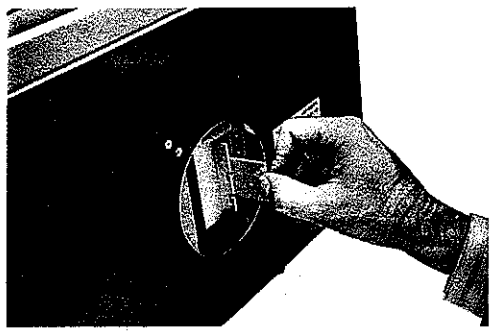
b. Carefully set instrument on its side. Loosen and remove three screws securing circular access plate to instrument base. Set access plate aside.



c. Using offset screwdriver, loosen (do not remove) two screws securing lamp-socket assembly to lamp-holder bracket.



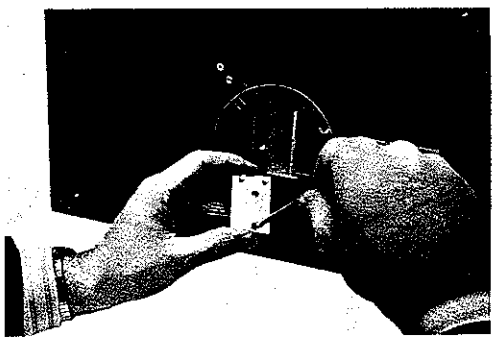
d. Carefully slip lamp-socket assembly free of lamp-holder bracket. Lift lamp-socket assembly out of instrument base.



e. Loosen (do not remove) two screws securing socket-stiffener plates to lamp socket. Remove lamp from socket.

IMPORTANT

Spare lamps (part #30950000) are provided with a protective cover. This cover should be left in place until lamp is completely installed. Additionally, lamps touched with bare fingers must be cleaned with isopropyl alcohol before a-c power is applied to instrument.



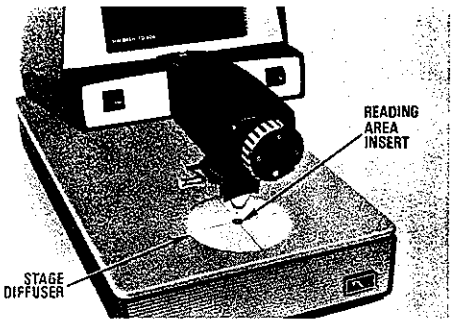
f. Install new lamp in socket; ensure that lamp prongs are fully seated in socket; tighten screws securing socket-stiffener plates to lamp socket.

g. Remount lamp socket assembly to lamp-holder bracket; do not tighten screws.

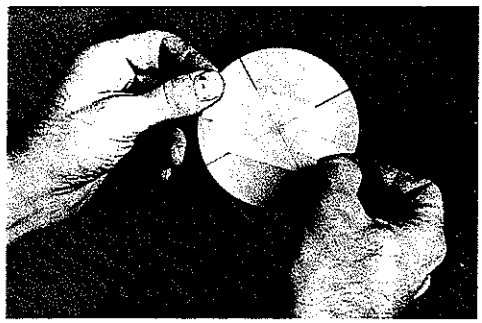
NOTE

Steps h through l below constitute the normal centering adjustment for the optical light source. Although greater lamp-centering precision is not normally required, it can be obtained by altering the data provided in steps h and i as follows: (h) leave the reading area insert in the stage diffuser; (i) place white paper ¾ of an inch above the stage diffuser.

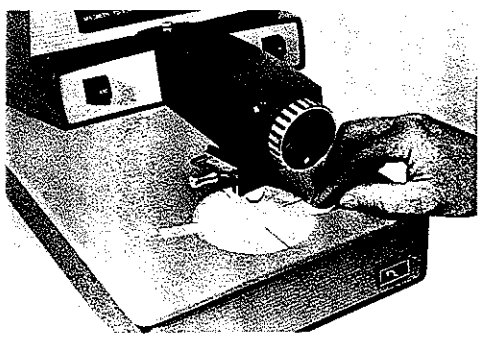
h. Using a common pencil eraser or a rod of soft material, wood or plastic push reading-area insert out of circular stage diffuser.



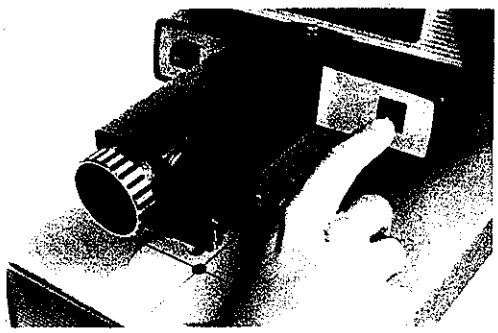
i. Place a piece of white paper over opening in stage diffuser; secure paper in position with tape.



j. Place stage diffuser in stage base and, using two small pieces of tape, secure stage diffuser in place.



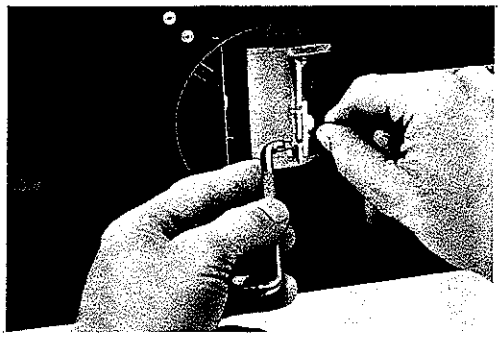
k. Connect TD-504 to a-c input power and push ON push button.

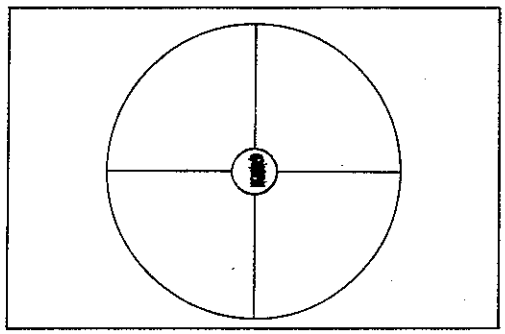


WARNING

Electrical leads for light source DS1 carry 9 volts a-c power. Conventional cautionary measures should be taken when working near the energized lamp. Do not short circuit lamp leads.

l. Position lamp-socket assembly as required so that filament image is centered in stage disc aperture (as seen on white paper). Tighten screws securing lamp-socket assembly to lamp holder bracket.



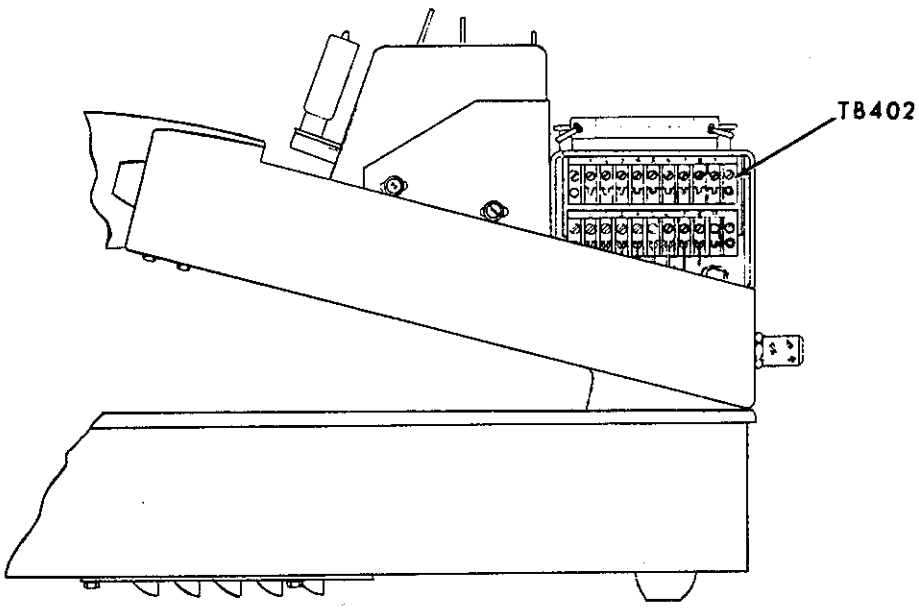


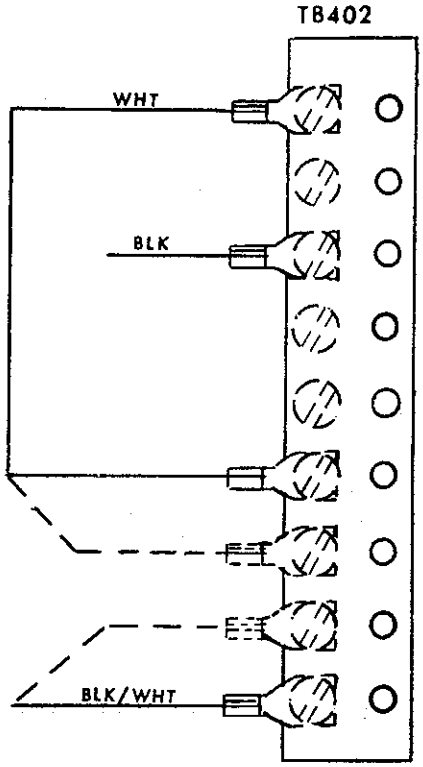
m. Reassemble instrument in reverse order of disassembly.

Addendum #1 to
TD-504 Operator's
Manual.

OPERATING VOLTAGE

In some instruments, the 115/230 and HI/LO switches have been replaced with terminal block TB402 (see sketch below). In these units, change from 115-volt to 230-volt operation (or vice versa) is accomplished via wiring changes as indicated on the reverse side of this page.

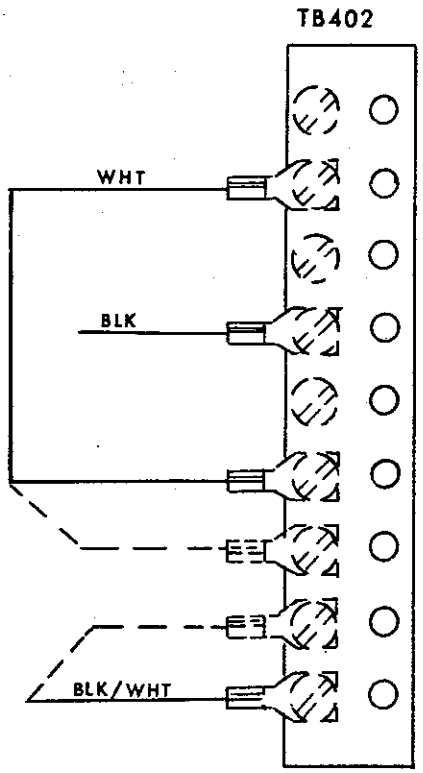




NOTE:

Hook up as shown for 115 vac "HI" operation. Hook up as shown in phantom lines for 230 vac "HI" operation.

A. 115/230 Volt "HI" Operation



NOTE:

Hook up as shown for 115 vac "LO" operation. Hook up as shown in phantom lines for 230 vac "LO" operation.

B. 115/230 Volt "LO" Operation

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