

UNITED STATES
 SECURITIES AND EXCHANGE COMMISSION
 WASHINGTON, D.C. 20549

 FORM S-8
 REGISTRATION STATEMENT
 UNDER
 THE SECURITIES ACT OF 1933

 KLA-TENCOR CORPORATION
 (Exact name of Registrant as specified in its charter)

 DELAWARE 04-2564110

 (State of Incorporation) (I.R.S. Employer Identification Number)

160 RIO ROBLES
 SAN JOSE, CA 95134
 (Address of Principal Executive Offices)

 KLA-TENCOR 401(k) PLAN
 (Full title of the plan)

 STUART J. NICHOLS
 VICE PRESIDENT AND GENERAL COUNSEL
 KLA-TENCOR CORPORATION
 160 RIO ROBLES
 SAN JOSE, CA 95134
 (Name and address of agent for service)
 (408) 875-4200
 (Telephone number, including area code, of agent for service)

 Copy to:
 Larry W. Sonsini, Esq.
 Bret M. DiMarco, Esq.
 WILSON SONSINI GOODRICH & ROSATI, P.C.
 650 Page Mill Road
 Palo Alto, CA 94304-1050
 (650) 493-9300

CALCULATION OF REGISTRATION FEE

<TABLE>
 <CAPTION>

| AMOUNT OF REGISTRATION FEE | TITLE OF SECURITIES TO BE REGISTERED | AMOUNT TO BE REGISTERED(1) | PROPOSED MAXIMUM OFFERING PRICE PER SHARE(2) | PROPOSED MAXIMUM AGGREGATE OFFERING PRICE |
|-------------------------------|---|----------------------------------|--|---|
| <S> | | <C> | <C> | <C> |
| <C> | Common Stock, \$.001 par value(3) | 1,500,000 | \$49.60 | \$74,400,000.00 |
| \$18,600.00 | | | | |

</TABLE>

(1) Pursuant to Rule 416(a) under the Securities Act of 1933, as amended (the "Securities Act"), this Registration Statement shall also cover any additional shares of the Registrant's Common Stock that become issuable under the KLA-Tencor 401(k) Plan described herein (the "Plan") by reason of any stock dividend, stock split, recapitalization or other similar transaction effected without the Registrant's receipt of consideration that

results in an increase in the number of the Registrant's outstanding shares of Common Stock.

- (2) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(c) in accordance with Rule 457(h) under the Securities Act, on the basis of \$49.60 per share, the average of the high and low prices per share of the Common Stock on the NASDAQ National Market on May 9, 2001.
- (3) Associated with the Common Stock are Common Stock Purchase Rights that will not be exercisable until the occurrence of certain prescribed events, none of which has occurred. In addition, pursuant to Rule 416(c) under the Securities Act, this Registration Statement also covers an indeterminate amount of interests to be offered or sold pursuant to the Plan.

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PART II

INFORMATION REQUIRED IN REGISTRATION STATEMENT

ITEM 3. INCORPORATION OF DOCUMENTS BY REFERENCE.

KLA-Tencor Corporation (the "Company" or the "Registrant") hereby incorporates the following documents by reference in this registration statement:

- (a) The Company's Annual Report on Form 10-K for the fiscal year ended June 30, 2000, filed on September 28, 2000;
- (b) The Company's Quarterly Report on Form 10-Q for the quarterly period ended September 30, 2000, filed on November 14, 2000;
- (c) The Company's Quarterly Report on Form 10-Q for the quarterly period ended December 31, 2000, filed on February 14, 2001;
- (d) The Company's Current Report on Form 8-K, filed on December 20, 2000;
- (e) The Company's Current Report on Form 8-K, filed on March 21, 2001;
- (f) All other reports filed by the Company pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act") since the end of the fiscal year covered by the Annual Report on Form 10-K referred to in (a) above;
- (g) Item 1 of the Company's Registration Statement on Form 8-A, filed on March 29, 1989;
- (h) Item 1 of the Company's Amendment No. 2 to its Registration Statement on Form 8-A/A, filed on September 24, 1996; and
- (i) All other descriptions of the Company's Common Stock contained in a registration statement filed under the Exchange Act, including any amendment or report filed for the purpose of updating such description.

All documents filed by the Company pursuant to Sections 13(a), 13(c), 14 and 15(d) of the Exchange Act, on or after the date of this registration statement and prior to the filing of a post-effective amendment which indicates that all securities offered have been sold or which deregisters all securities then remaining unsold, shall be deemed to be incorporated by reference in this registration statement and to be part hereof from the date of filing of such documents.

ITEM 4. DESCRIPTION OF SECURITIES.

Not applicable.

ITEM 5. INTERESTS OF NAMED EXPERTS AND COUNSEL.

Not applicable.

ITEM 6. INDEMNIFICATION OF DIRECTORS AND OFFICERS.

Section 145(a) of the Delaware General Corporation Law (the "DGCL") provides in relevant part that "[a] corporation may indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of the corporation) by reason of the fact that he is or was

a director, officer, employee or agent of the corporation, or is or was serving at the request of the corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by him in connection with such action, suit or proceeding if he acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the corporation, and, with respect to any criminal action or proceeding, had no reasonable cause to believe his conduct was unlawful." With respect to derivative actions, Section 145(b) of the DGCL provides in relevant part that "[a] corporation may indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action or suit by or in the right of the corporation to procure a judgment in its favor... [by reason of his service in one of the capacities specified in the preceding sentence] against expenses (including attorneys' fees) actually and reasonably incurred by him in connection with the defense or settlement of such action or suit if he acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the corporation and except that no indemnification shall be made in respect of any claim, issue or matter as to which such person shall have been adjudged to be liable to the corporation unless and only to the extent that the Court of Chancery or the court in which such action or suit was brought shall determine upon application that, despite the adjudication of liability but in view of all the circumstances of the case, such person is fairly and reasonably entitled to indemnity for such expenses which the Court of Chancery or such other court shall deem proper."

The Registrant's Amended and Restated Certificate of Incorporation provides that to the fullest extent permitted by the DGCL, no director of the Registrant shall be personally liable to the Registrant or its stockholders for monetary damages for breach of fiduciary duty as a director. The Amended and Restated Certificate of Incorporation also provides that no amendment or repeal of such provision shall apply to or have any effect on the right to indemnification permitted thereunder with respect to claims arising from acts or omissions occurring in whole or in part before the effective date of such amendment or repeal whether asserted before or after such amendment or repeal.

The Registrant's Bylaws provide that the Registrant shall indemnify to the fullest extent permitted by the DGCL each of its directors, officers, employees and other agents against expenses actually and reasonably incurred in connection with any proceeding arising by reason of the fact that such person is or was an agent of the Registrant.

The Registrant has entered into indemnification agreements with its directors and executive officers and intends to enter into indemnification agreements with any new directors and executive officers in the future.

ITEM 7. EXEMPTION FROM REGISTRATION CLAIMED.

Not applicable.

ITEM 8. EXHIBITS.

| EXHIBIT NUMBER | DESCRIPTION |
|----------------|--|
| 4.1* | KLA-Tencor 401(k) Plan (July 1, 1997 Restatement), as amended by Amendments No. 1 through 5 thereto |
| 5.1 | Undertaking re: Status of Favorable Determination Letter Covering the Plan The Registrant has received a favorable determination letter from the Internal Revenue Service (the "IRS") concerning the qualification of the KLA-Tencor 401(k) Plan (the "Plan") under Section 401(a) and related provisions of the Internal Revenue Code of 1986, as amended. The Registrant will submit any future material amendments to the Plan to the IRS with a request for a favorable determination that the Plan, as amended, continues to so qualify. |

| EXHIBIT NUMBER | DESCRIPTION |
|----------------|------------------------------------|
| 23.1 | Consent of independent accountants |
| 24.1 | Power of attorney |

* Incorporated by reference to Exhibits 4.1 to KLA-Tencor Corporation's Registration Statement on Form S-8 filed on September 26, 2000 (File No. 333-46598) and Registration Statement on Form S-8 filed on November 13,

ITEM 9. UNDERTAKINGS.

(a) The undersigned Registrant hereby undertakes:

(1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:

(i) To include any prospectus required by section 10(a)(3) of the Securities Act of 1933, as amended (the "Securities Act");

(ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement;

(iii) To include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration statement;

Provided, however, that paragraphs (a)(1)(i) and (a)(1)(ii) do not apply if the information required to be included in a post-effective amendment by those paragraphs is contained in periodic reports filed by the Registrant pursuant to Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act") that are incorporated by reference in the registration statement.

(2) That, for the purpose of determining any liability under the Securities Act each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

(3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

(b) The undersigned Registrant hereby undertakes that, for purposes of determining any liability under the Securities Act, each filing of the Registrant's annual report pursuant to Section 13(a) or Section 15(d) of the Exchange Act (and, where applicable, each filing of an employee benefit plan's annual report pursuant to Section 15(d) of the Exchange Act) that is incorporated by reference in the registration statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

(c) Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the Registrant pursuant to the foregoing provisions, or otherwise, the Registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Act and is, therefore, unenforceable. In the

event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

SIGNATURES

THE REGISTRANT

Pursuant to the requirements of the Securities Act of 1933, the Registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-8 and has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Jose, State of California on the 14th day of May, 2001.

KLA-TENCOR CORPORATION

By /s/ Stuart J. Nichols

Stuart J. Nichols
Vice President and General Counsel

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities and on the dates indicated.

<TABLE>
<CAPTION>

| Signature | Title | Date |
|-----------|-------|------|
| <S> | <C> | <C> |

Principal Executive Officer:

| | | |
|---|---------------------------------------|--------------|
| /s/ Kenneth L. Schroeder ----- Kenneth L. Schroeder | President and Chief Executive Officer | May 14, 2001 |
|---|---------------------------------------|--------------|

Principal Financial and
Accounting Officer:

| | | |
|---|---|--------------|
| /s/ John Kispert ----- John Kispert | Executive Vice President and Chief Financial Officer | May 14, 2001 |
|---|---|--------------|

</TABLE>

<TABLE>
<CAPTION>

| Signature | Title | Date |
|-----------|-------|------|
| <S> | <C> | <C> |

Directors:

| | | |
|---|------------------------------------|--------------|
| /s/ Kenneth Levy ----- Kenneth Levy | Chairman of the Board and Director | May 14, 2001 |
|---|------------------------------------|--------------|

| | | |
|---|----------|--------------|
| /s/ Edward W. Barnholt ----- Edward W. Barnholt | Director | May 14, 2001 |
|---|----------|--------------|

| | | |
|---|----------|--------------|
| /s/ Richard J. Elkus, Jr. ----- Richard J. Elkus, Jr. | Director | May 14, 2001 |
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| | | |
|---|----------|--------------|
| /s/ Dean O. Morton ----- Dean O. Morton | Director | May 14, 2001 |
|---|----------|--------------|

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|---|----------|--------------|
| /s/ Jon D. Tompkins ----- Jon D. Tompkins | Director | May 14, 2001 |
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|---|----------|--------------|
| /s/ Lida Urbanek ----- Lida Urbanek | Director | May 14, 2001 |
|---|----------|--------------|

| | | |
|---|----------|--------------|
| /s/ H. Raymond Bingham ----- H. Raymond Bingham | Director | May 14, 2001 |
|---|----------|--------------|

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|---|----------|--------------|
| /s/ Kenneth L. Schroeder ----- Kenneth L. Schroeder | Director | May 14, 2001 |
|---|----------|--------------|

| | | |
|---|----------|--------------|
| /s/ Robert T. Bond ----- Robert T. Bond | Director | May 14, 2001 |
|---|----------|--------------|

*By /s/ Stuart J. Nichols

Stuart J. Nichols
Attorney-in-Fact

</TABLE>

A majority of the members of the Board of Directors.

THE PLAN

Pursuant to the requirements of the Securities Act of 1933, the Registrant, as the administrator of the KLA-Tencor 401(k) Plan, has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Jose, State of California on the 14th day of May, 2001.

KLA-TENCOR 401(K) PLAN
(Plan)

By /s/ Kenneth L. Schroeder

Kenneth L. Schroeder
President and Chief Executive Officer

INDEX TO EXHIBITS

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| 5.1 | Undertaking re: Status of Favorable Determination Letter Covering the Plan. (See Item 8 of this Registration Statement) |
| 23.1 | Consent of independent accountants |
| 24.1 | Power of attorney |

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* Incorporated by reference to Exhibits 4.1 to KLA-Tencor Corporation's Registration Statement on Form S-8 filed on September 26, 2000 (File No. 333-46598) and Registration Statement on Form S-8 filed on November 13, 2000 (File No. 333-49766).

CONSENT OF INDEPENDENT ACCOUNTANTS

We hereby consent to the incorporation by reference in this Registration Statement on Form S-8 of our report dated July 24, 2000, except as to Note 9 which is as of August 15, 2000, relating to the consolidated financial statements of KLA-Tencor Corporation, which appears in KLA-Tencor Corporation's Annual Report on Form 10-K for the year ended June 30, 2000. We also consent to the incorporation by reference of our report dated July 24, 2000 relating to the financial statement schedule, which appears in such Annual Report on Form 10-K.

/s/ PricewaterhouseCoopers LLP

San Jose, California
May 11, 2001

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, Each of the undersigned directors of KLA-Tencor Corporation, a Delaware corporation (the "Company"), hereby constitutes and appoints STUART J. NICHOLS as his or her true and lawful attorney-in-fact, for him or her and in his or her name, place and stead, in any and all capacities, to execute a Registration Statement or Registration Statements on Form S-8 or other appropriate form, under the Securities Act of 1933, as amended, relating to up to 1,500,000 additional shares of common stock, \$0.001 par value, of the Company, and an indeterminate number of plan interests to be offered and sold pursuant to the KLA-Tencor 401(k) Plan, as amended, and any and all amendments (including post-effective amendments) to such Registration Statements, and to file such Registration Statements and any and all amendments thereto, with exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorney-in-fact full power and authority to do and perform each and every act and thing necessary or desirable to be done in and about the premises, as fully to all intents and purposes, as he or she might or could do in person, thereby ratifying and confirming all that said attorney-in-fact may lawfully do or cause to be done by virtue hereof.

IN WITNESS WHEREOF, I have hereunto set my hand this 14th day of May, 2001.

/s/ Kenneth Levy

Kenneth Levy

/s/ Kenneth L. Schroeder

Kenneth L. Schroeder

/s/ Edward W. Barnholt

Edward W. Barnholt

/s/ Richard J. Elkus, Jr.

Richard J. Elkus, Jr.

/s/ Dean O. Morton

Dean O. Morton

/s/ Jon D. Tompkins

Jon D. Tompkins

/s/ Lida Urbanek

Lida Urbanek

/s/ H. Raymond Bingham

H. Raymond Bingham

/s/ Robert T. Bond

Robert T. Bond