

**UNITED STATES**  
**SECURITIES AND EXCHANGE COMMISSION**  
 Washington, D.C. 20549

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

**MERCURY COMPUTER SYSTEMS, INC.**

(Exact Name of Registrant as Specified in its Charter)

Massachusetts  
 (State of Incorporation)

04-2741391  
 (I.R.S. Employer  
 Identification Number)

201 Riverneck Road  
 Chelmsford, Massachusetts 01824  
 (978) 256-1300  
 (Address of Principal Executive Offices)

MERCURY COMPUTER SYSTEMS, INC.  
 1997 Employee Stock Purchase Plan  
 (Full Title of the Plan)

Gerald M. Haines II  
 Senior Vice President, Corporate Development,  
 Chief Legal Officer, and Secretary  
 Mercury Computer Systems, Inc.  
 201 Riverneck Road  
 Chelmsford, Massachusetts 01824  
 (978) 256-1300  
 (Name, Address and Telephone Number, Including Area Code, of Agent for Service)

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer," and "smaller reporting company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer  Accelerated filer   
 Non-accelerated filer  (Do not check if a smaller reporting company) Smaller reporting company

**CALCULATION OF REGISTRATION FEE**

Title of Securities to be Registered	Amount to be Registered(1)(2)	Proposed Maximum Offering Price Per Share(3)	Proposed Maximum Aggregate Offering Price(3)	Amount of Registration Fee
Common Stock	300,000	\$14.25	\$4,275,000	\$490

- (1) This registration statement also covers preferred stock purchase rights (the "Rights") which are presently attached to and trade with the registrant's common stock. Any value attributable to the Rights is reflected in the market price of the common stock.
- (2) In addition, pursuant to Rule 416(a) under the Securities Act of 1933, as amended (the "Securities Act"), this registration statement also covers an indeterminate number of additional shares of common stock to be offered or sold as a result of the anti-dilution provisions of the employee benefit plan described herein, including to prevent dilution resulting from any reorganization, recapitalization, reclassification, stock dividend, stock split, or other similar change.
- (3) Calculated in accordance with Rule 457(c) and (h) under the Securities Act solely for the purpose of determining the amount of the registration fee, based on the average of the high and low prices on the NASDAQ Global Select Market on November 1, 2011.

## EXPLANATORY NOTE

This registration statement is being filed solely for the purpose of registering 300,000 additional shares of common stock, par value \$.01 per share (the "Common Stock"), of Mercury Computer Systems, Inc. (the "Company") to be offered to participants under the Mercury Computer Systems, Inc. 1997 Employee Stock Purchase Plan, as amended (the "Plan"), originally adopted in 1997 and most recently amended and restated on September 13, 2011 (and approved by the Company's shareholders on October 21, 2011). The maximum number of shares issuable under the Plan is 1,400,000 shares, of which 500,000 shares were previously registered with the Securities and Exchange Commission (the "Commission") on Form S-8 (File No. 333-53291 filed on May 21, 1998), as adjusted for a 2-for-1 stock split on December 21, 1999 pursuant to Rule 416(a) under the Securities Act, and 600,000 were previously registered with the Commission on Form S-8 (File No. 333-139020 filed on November 30, 2006 and File No. 333-163707 filed on December 14, 2009, and together with the Form S-8 File No. 333-53291 filed on May 21, 1998, the "Prior Registration Statement").

Pursuant to General Instruction E of Form S-8, the contents of the Prior Registration Statement are incorporated herein by reference, except as otherwise noted below.

## PART II

### INFORMATION REQUIRED IN THE REGISTRATION STATEMENT

#### ITEM 3. INCORPORATION OF DOCUMENTS BY REFERENCE.

The following documents are incorporated herein by reference:

- (a) The Company's annual report on Form 10-K for the fiscal year ended June 30, 2011, as filed with the Commission on August 18, 2011;
- (b) The Company's quarterly report on Form 10-Q for the fiscal quarter ended September 30, 2011, as filed with the Commission on November 4, 2011;
- (d) The Company's current reports on Form 8-K filed with the Commission on August 2, 2011 (Item 5.02 only) and October 21, 2011;
- (e) The description of the Company's Common Stock contained in the Company's registration statement on Form 8-A dated January 7, 1998, as filed with the Commission pursuant to Section 12 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), including any amendment thereto or report filed for the purpose of updating such description; and
- (f) The description of the Company's preferred stock purchase rights contained in the Company's registration statement on Form 8-A dated December 15, 2005, as filed with the Commission pursuant to Section 12 of the Exchange Act, including any amendment thereto or report filed for the purpose of updating such description.

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

#### ITEM 5. INTERESTS OF NAMED EXPERTS AND COUNSEL.

The validity of the Common Stock offered under this registration statement will be passed upon for the Company by Bingham McCutchen LLP, Boston, Massachusetts. Bingham McCutchen LLP does not have a substantial interest, direct or indirect, in the Company.

**ITEM 8. EXHIBITS.**

Exhibit	Description
4.1	Articles of Organization (incorporated herein by reference to Exhibit 3.1 of the Company's annual report on Form 10-K for the fiscal year ended June 30, 2009)
4.2	Articles of Amendment (incorporated herein by reference to Exhibit 3.2 of the Company's annual report on Form 10-K for the fiscal year ended June 30, 2010)
4.3	Articles of Amendment (incorporated herein by reference to Exhibit 1 of the Company's registration statement on Form 8-A, as filed with the Commission on December 15, 2005)
4.4	By-laws, amended and restated effective May 4, 2011 (incorporated herein by reference to Exhibit 3.2 of the Company's quarterly report on Form 10-Q for the quarter ended March 31, 2011 filed with the Commission on May 5, 2011)
4.8	Shareholder Rights Agreement, dated as of December 14, 2005, between the Company and Computershare Trust Company, N.A. (formerly known as EquiServe Trust Company, N.A.) (incorporated herein by reference to Exhibit 2 of the Company's registration statement on Form 8-A, as filed with the Commission on December 15, 2005)
4.9	Mercury Computer Systems, Inc. Amended and Restated 2005 Stock Incentive Plan (incorporated herein by reference to Appendix A of the Company's Definitive Proxy Statement filed with the Commission on September 19, 2011)
5.1*	Opinion of Bingham McCutchen LLP
23.1*	Consent of KPMG LLP
23.2	Consent of Bingham McCutchen LLP (contained in the opinion filed as Exhibit 5.1 to this registration statement)
24.1	Power of Attorney (included in signature page to this registration statement)

\* Filed herewith

## SIGNATURES

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 town of Chelmsford, the Commonwealth of Massachusetts on this 4th day of November, 2011.

MERCURY COMPUTER SYSTEMS, INC.

By: /s/ Gerald M. Haines II

Gerald M. Haines II  
Senior Vice President, Corporate Development, Chief  
Legal Officer, and Secretary

### Power of Attorney

KNOW ALL MEN BY THESE PRESENTS that each person whose signature appears below constitutes and appoints Mark Aslett, Robert E. Hult, and Gerald M. Haines II his true and lawful attorneys-in-fact and agents, each acting alone, with full powers of substitution and resubstitution, for him or in his name, place and stead, in any and all capacities to sign any and all amendments or post-effective amendments to this registration statement (or any registration statement for the same offering that is to be effective upon filing pursuant to Rule 462(b) under the Securities Act of 1933), and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, each acting alone, full power and authority to do and perform each and every act and thing requisite or necessary to be done in and about the premises, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, each acting alone, or his substitute or substitutes, may lawfully do or cause to be done by virtue hereof.

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.

Signature	Title	Date
<u>/s/ Mark Aslett</u> Mark Aslett	President, Chief Executive Officer, and Director (Principal Executive Officer)	November 4, 2011
<u>/s/ Robert E. Hult</u> Robert E. Hult	Senior Vice President, Chief Financial Officer, and Treasurer (Principal Financial Officer)	November 4, 2011
<u>/s/ Charles A. Speicher</u> Charles A. Speicher	Vice President, Controller, and Chief Accounting Officer (Principal Accounting Officer)	November 4, 2011
<u>/s/ Vincent Vitto</u> Vincent Vitto	Chairman of the Board of Directors	November 4, 2011
<u>/s/ James K. Bass</u> James K. Bass	Director	November 4, 2011
<u>/s/ George W. Chamillard</u> George W. Chamillard	Director	November 4, 2011

<u>/s/ Michael A. Daniels</u> Michael A. Daniels	Director	November 4, 2011
<u>/s/ George K. Muellner</u> George K. Muellner	Director	November 4, 2011
<u>/s/ William K. O'Brien</u> William K. O'Brien	Director	November 4, 2011
<u>/s/ Lee C. Steele</u> Lee C. Steele	Director	November 4, 2011

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[Letterhead of Bingham McCutchen LLP]

November 4, 2011

Mercury Computer Systems, Inc.  
201 Riverneck Road  
Chelmsford, Massachusetts 01824

**Re: Registration Statement on Form S-8**

Ladies and Gentlemen:

This opinion is furnished in connection with the registration, pursuant to a Registration Statement on Form S-8 under the Securities Act of 1933, as amended (the "Securities Act"), to be filed with the Securities and Exchange Commission on or about November 4, 2011 (the "Registration Statement"), of an aggregate of 300,000 shares (the "Shares") of common stock, par value \$0.01 per share (the "Common Stock"), of Mercury Computer Systems, Inc., a Massachusetts corporation (the "Company"), that may be issued pursuant to the Company's 1997 Employee Stock Purchase Plan (as amended and restated through September 13, 2011) (the "Plan").

We have acted as counsel to the Company in connection with the foregoing registration of the Shares. We have examined and relied upon originals or copies of such records, instruments, certificates, memoranda, and other documents as we have deemed necessary or advisable for purposes of this opinion and have assumed, without independent inquiry, the accuracy of those documents. In that examination, we have assumed the genuineness of all signatures, the conformity to the originals of all documents reviewed by us as copies, and the authenticity and completeness of all original documents reviewed by us in original or copy form. We have further assumed that all Shares sold will be sold in accordance with the terms of the Plan.

This opinion is limited solely to the substantive laws of the Commonwealth of Massachusetts.

Based upon and subject to the foregoing, we are of the opinion that upon the issuance and the delivery of the Shares in accordance with the terms of the Plan, the Shares will be validly issued, fully paid, and nonassessable.

We hereby consent to the inclusion of this opinion as Exhibit 5.1 to the Registration Statement. In giving our consent, we do not admit that we are in the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations thereunder.

Very truly yours,

/S/ BINGHAM MCCUTCHEN LLP

BINGHAM MCCUTCHEN LLP

## Consent of Independent Registered Public Accounting Firm

The Board of Directors  
Mercury Computer Systems, Inc.:

We consent to the use of our report dated August 18, 2011, with respect to the consolidated balance sheets of Mercury Computer Systems, Inc. and subsidiaries as of June 30, 2011 and 2010, and the related consolidated statements of operations, shareholders' equity and cash flows for each of the years in the three-year period ended June 30, 2011, the related financial statement schedule, and the effectiveness of internal control over financial reporting as of June 30, 2011, incorporated herein by reference.

Our report dated August 18, 2011, on the effectiveness of internal control over financial reporting as of June 30, 2011, contains an explanatory paragraph that states management excluded from its assessment of the effectiveness of Mercury Computer Systems, Inc.'s internal control over financial reporting as of June 30, 2011 LNX Corporation's internal control over financial reporting associated with total assets of 12 percent and total revenues of 2 percent included in the consolidated financial statements of Mercury Computer Systems, Inc. and subsidiaries as of and for the year ended June 30, 2011.

Our report refers to the Company's change in its method of accounting for revenue arrangements with multiple-deliverables entered into or substantially modified after July 1, 2009 to adopt FASB ASU No. 2009-13, *Multiple-Deliverable Revenue Arrangements*.

/s/ KPMG LLP

Boston, Massachusetts  
November 4, 2011