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Record Group/Collection: George H.W. Bush Presidential Records
Collection/Office of Origin: Speechwriting, White House Office of
Series: Speech File Backup Files
Subseries: Chron File, 1989-1993

OA/ID Number: 13778
Folder ID Number: 13778-011

Folder Title:
Marlow Industries - Dallas, Texas 11/1/91 [OA 8317] [1]

Stack:	Row:	Section:	Shelf:	Position:
G	26	21	7	3

(Duggan/Simon)
October 25, 1991
Draft Two
Baldrige

PRESIDENTIAL REMARKS: BALDRIGE AWARD
MARLOW INDUSTRIES
DALLAS, TEXAS
FRIDAY, NOVEMBER 1, 1991

[Acknowledgments, jokes]

First, let me compliment the makers of this splendid map that forms our backdrop. What a work of imagination: At first glance one might think it's a conventional map of the world. But a more careful inspection shows it is a symbolic picture of Marlow Industries' ambitious business goals and expectations. It's a whole world of your own making. \\

It reminds me of a remark by the great American revolutionary, Thomas Paine. As Americans fought the War for Independence -- which was a struggle for free enterprise as well as political freedom -- Paine said, "We have it in our power to begin the world over again." \\

Today we're celebrating a new revolution. It doesn't involve cannons and muskets and political tumult, but it's a revolution all the same. I'm speaking of the movement in American business for continuous quality improvement. \\

The best businesses in America -- large and small -- are renewing, even reinventing themselves to become and to remain world class competitors. Our companies are overthrowing outdated, antagonistic barriers between labor and management. Companies are replacing "us-versus-them" divisions with true teamwork.

The quality revolution is driving bureaucracy out of our business organizations. Companies committed to quality are doing away with stratification, leaving as little distance as possible between the most junior employee and the CEO. In this quest, employees at every level are enjoying more power, more incentive, more freedom to create, and more responsibility for their efforts.

America is improving the quality of its products and services with the keenest tools of statistical process control. The quality revolution topples barriers that used to isolate backroom "number crunchers" from the people who work the assembly lines and the service counters. Companies like Marlow Industries show that everyone in an organization can and should use statistical methods and computer and information technology to improve the quality of his own performance. As a result, Americans are learning how to prevent defects in the first place -- instead of correcting them later.

Most important, the quality revolution helps American companies to put customer satisfaction at the forefront. \\ Winning competitors know that customers don't want just the best that one company can offer; they want the best that anyone in the world can offer. \\ That's why winners in any market or niche must hold themselves to world-class standards. \\

Quality has strengthened American companies to endure the ups and downs of business cycles. The new commitment to world-class excellence will make American businesses stronger than ever as we recover from the recession. And the most important long-term indicators are favorable for recovery. The index of leading indicators has been steady or increasing for seven months; it is now 5 percent higher than in January. Long-term interest rates are on the decline. Industrial production increased in September for the sixth consecutive month, while manufacturing productivity rose by 3.6 percent during the quarter.

In this climate, one thing I'm determined not to do is to break the budget deal and open up the floodgates for congressional tax-and-spend politics. \\\ That's why I support an unemployment compensation bill that will comply with the budget accord -- and that's why I vetoed the unemployment compensation bill that irresponsibly tried to bust the budget. \\

I am doing my level best in Washington to pursue the kind of economic policies that let companies like this one lead the way to quality.

The potential of our quality revolution reaches far beyond anything that appears on a balance sheet. Take educating our kids for example. David Kearns led Xerox to win the Baldrige Award in 1989, and now I am privileged to have him in my Administration as Deputy Secretary of Education. Like his predecessor Ted Sanders -- a distinguished Dallas educator, of whom we are all proud -- David Kearns is committed to bringing about a quality revolution in our schools to cut back on bureaucracy while enhancing learning and teaching and parental involvement. We want to reinvent American schools -- in a revolution for educational quality no less dramatic than the revolution for improving business performance.

America's new commitment to quality would not have been possible without the pioneering work of strategic thinkers such as W. Edwards Deming. Four decades ago, Dr. Deming offered himself as a sort of one-man Marshall Plan in the war ruins of Japan. His common sense was "Made in America," and it inspired Japanese businesses to heights of excellence considered miraculous. Now at long last American businesses follow rigorous disciplines of continuous quality improvement as envisioned by such pathfinders as Dr. Deming. \\

And we owe so much to Malcolm Baldrige. Mac Baldrige was a rough-riding Renaissance figure -- the kind of man found only in America. \\ He was one of my dearest friends, and his untimely death four years ago still leaves me feeling a loss. \\

As Secretary of Commerce during the 1980s, Mac Baldrige worked hard to liberate American businesses from needless regulation. But much as he cherished economic freedom, he believed it was not worth much if companies failed to perform at their best. So Mac spent much of his time in the bully pulpit urging American business to pursue excellence. The National Quality Awards competition, now named in his honor, is one of Mac's greatest legacies. \\

Three small companies, each an electronics manufacturer, merited the 1991 Baldrige Award: Solectron Corporation of San Jose, California; Zytec Corporation of Eden Prairie, Minnesota;

and, of course, Marlow Industries of Dallas. All three winners prove that American enterprise can succeed in world-class competition involving the most sophisticated technologies and the most discerning customers. All three make America proud with their success in export markets. \\

I am proud to be with the men and women of Marlow Industries today, proud to congratulate you for navigating the "Baldrige Award Strait" on your map of dreams. \\\

And because Marlow supplies critical components for high-tech national defense systems, let me offer a special word of thanks for the brilliant contribution you made to the success of our troops and sailors and airmen in Operation Desert Storm. \\\

Like all Baldrige Award winners, you now accept responsibility to share your ideas and experiences on quality improvement with thousands of other companies. You've already done good work developing benchmarks and lifting industry standards through the Texas Quality Consortium. \\ Now you're charged with a bigger mission: helping thousands of other businesses throughout the nation to chart their journeys to world class performance, helping them launch new worlds of opportunity and achievement. I wish you Godspeed. \\

Thank you, and God bless the United States of America.

# # #

(Duggan/Simon)
October 24, 1991
Draft One
Baldrige

PRESIDENTIAL REMARKS: BALDRIGE AWARD
MARLOW INDUSTRIES
DALLAS, TEXAS
FRIDAY, NOVEMBER 1, 1991

[Acknowledgments, jokes]

First, let me compliment the maker of this splendid map that forms our backdrop. What a work of imagination: At first glance one might think it's a conventional map of the world. But a more careful inspection shows it is a symbolic picture of Marlow Industries' ambitious business goals and expectations. It's a whole world of your own invention. \\

It reminds me of a remark by the great American revolutionary, Thomas Paine. As Americans fought the War for Independence -- which was a struggle for free enterprise as well as political freedom -- Paine said, "We have it in our power to start the world all over again." \\

Today we're celebrating a new revolution. It doesn't involve cannons and muskets and political tumult, but it's a revolution all the same. I'm speaking of the movement in American business for continuous quality improvement. \\

The best businesses in America -- large and small -- are renewing, even reinventing themselves to become and to remain world class competitors. Our companies are overthrowing outdated, antagonistic barriers between labor and management.

Companies are replacing "us-versus-them" divisions with true teamwork.

The quality revolution is driving bureaucracy out of our business organizations. Companies committed to quality are doing away with stratification, leaving as little distance as possible between the most junior employee and the CEO. Participants at every level of our quality-driven enterprises are enjoying more power, more incentive, more freedom to create, and more responsibility for their efforts.

America is sharpening the quality of its products and services with the keenest tools of statistical process control. The quality revolution is toppling barriers that used to isolate backroom "number crunchers" from the people who work the assembly lines and the service counters. Companies like Marlow Industries are showing that everyone in an organization can and should use statistical methods and computer and information technology to improve the quality of his own performance. As a result, Americans are learning how to prevent defects instead of looking for them after it's too late to correct them.

Most important, the quality revolution is motivating American companies to put customer satisfaction at the forefront. \\ Winning competitors know that customers aren't seeking simply the best that one company can offer; they want the best that anyone in the world can offer. \\ That's why winners in any market or niche must hold themselves to world-class standards. \\

I see no limit to the benefit that our quality revolution can promote. The potential reaches far beyond anything that could be described on a balance sheet. Take educating our kids for example. David Kearns led Xerox to win the Baldrige Award in 1989, and now I am privileged to have him in my Administration as Deputy Secretary of Education. Like his predecessor Ted Saunders -- a distinguished Dallas educator, of whom we are all proud -- David Kearns is committed to bringing about a quality revolution in our schools, to cut back on bureaucracy while enhancing learning and teaching and parental involvement.

reinvent schools

America's new commitment to quality would not have been possible without the pioneering work of strategic thinkers such as W. Edwards Deming. Four decades ago, Dr. Deming offered himself as a sort of one-man Marshall Plan in the war ruins of Japan. His common sense was "Made in America," and it inspired Japanese businesses to heights of excellence considered miraculous. Now at long last American businesses are committing themselves to rigorous discplines of continuous quality improvement as envisioned by such pathfinders as Dr. Deming. \\

And we owe so much to Malcolm Baldrige. Mac Baldrige was a rough-riding Renaissance figure -- the kind of man that's found only in America. \\ He was one of my dearest friends, and his untimely death four years ago still grieves me. \\

As Secretary of Commerce during the 1980s, Mac Baldrige worked hard to liberate American businesses from needless regulation. But much as he cherished economic freedom, he believed it was not worth much if companies failed to perform at their best. So Mac spent much of his time in the bully pulpit urging American business to pursue excellence. The National Quality Awards competition, now named in his honor, is one of Mac's greatest legacies. \\

Three small companies, each an electronics manufacturer, merited the 1991 Baldrige Award: Solectron Corporation of San Jose, California; Zytec Corporation of Eden Prairie, Minnesota; and, of course, Marlow Industries of Dallas. All three winners give proof that American enterprise can succeed in world-class competition involving the most sophisticated technologies and the most discerning customers. All three make America proud with their success in export markets. \\

I am proud to be with the men and women of Marlow Industries today, proud to congratulate you for navigating that last difficult strait on your map of dreams. \\\

And because Marlow is a critical supplier of components for high-tech national defense systems, let me offer a special word of thanks for the brilliant contribution you made to the success of our troops and sailors and airmen in Operation Desert Storm. \\\ And thanks to Marlow and many, many other excellent defense contractors, I am confident our Defense Department's commitment to total quality management will meet success. \\\

Like all Baldrige Award winners, you now accept responsibility to share your ideas and experiences on quality improvement with thousands of other companies. You've already done good work developing benchmarks and lifting industry standards through the Texas Quality Consortium. \\ Now you're charged with a bigger mission: helping thousands of other businesses throughout the nation to chart their maps to quality, helping them launch new worlds of opportunity and achievement. I wish you Godspeed. \\

Thank you, and God bless the United States of America.

# # #

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(Duggan/Simon)
October 25, 1991
Draft Two
Baldrige

Mosbacher

PRESIDENTIAL REMARKS: BALDRIGE AWARD
MARLOW INDUSTRIES
DALLAS, TEXAS
FRIDAY, NOVEMBER 1, 1991

Mr. + Mrs Roy Marlow
Elizabeth
Chris Witzkie - C.O.O.
Elizabeth

[Acknowledgments, jokes]

First, let me compliment the makers of this splendid map that forms our backdrop. What a work of imagination: At first glance one might think it's a conventional map of the world. But a more careful inspection shows it is a symbolic picture of Marlow Industries' ambitious business goals and expectations. It's a whole world of your own making. \\

see file

It reminds me of a remark by the great American revolutionary, Thomas Paine. As Americans fought the War for Independence -- which was a struggle for free enterprise as well as political freedom -- Paine said, "We have it in our power to begin the world over again." \\

Today we're celebrating a new revolution. It doesn't involve cannons and muskets and political tumult, but it's a revolution all the same. I'm speaking of the movement in American business for continuous quality improvement. \\

The best businesses in America -- large and small -- are renewing, even reinventing themselves to become and to remain world class competitors. Our companies are overthrowing outdated, antagonistic barriers between labor and management. Companies are replacing "us-versus-them" divisions with true teamwork.

The quality revolution is driving bureaucracy out of our business organizations. Companies committed to quality are doing away with stratification, leaving as little distance as possible between the most junior employee and the CEO. In this quest, employees at every level are enjoying more power, more incentive, more freedom to create, and more responsibility for their efforts.

America is improving the quality of its products and services with the keenest tools of statistical process control. The quality revolution topples barriers that used to isolate backroom "number crunchers" from the people who work the assembly lines and the service counters. Companies like Marlow Industries show that everyone in an organization can and should use statistical methods and computer and information technology to improve the quality of his own performance. As a result, Americans are learning how to prevent defects in the first place -- instead of correcting them later.

Most important, the quality revolution helps American companies to put customer satisfaction at the forefront. \\ Winning competitors know that customers don't want just the best that one company can offer; they want the best that anyone in the world can offer. \\ That's why winners in any market or niche must hold themselves to world-class standards. \\

Quality has strengthened American companies to endure the ups and downs of business cycles. The new commitment to world-class excellence will make American businesses stronger than ever as we recover from the recession. And the most important long-term indicators are favorable for recovery. The index of leading indicators has been steady or increasing for seven months; it is now 5 percent higher than in January. Long-term interest rates are on the decline. Industrial production increased or was steady in September for the sixth consecutive month, while manufacturing productivity rose ~~by~~ at an 3.6 percent annual rate during the second quarter.

Kitty Furchtgott CEA x5062

In this climate, one thing I'm determined not to do is to break the budget deal and open up the floodgates for congressional tax-and-spend politics. \\\ That's why I support an unemployment compensation bill that will comply with the budget accord -- and that's why I vetoed the unemployment compensation bill that irresponsibly tried to bust the budget. \\

I am doing my level best in Washington to pursue the kind of economic policies that let companies like this one lead the way to quality.

The potential of our quality revolution reaches far beyond anything that appears on a balance sheet. Take educating our kids for example. David Kearns led Xerox to win the Baldrige Award in 1989, and now I am privileged to have him in my Administration as Deputy Secretary of Education. ~~Like his predecessor Ted Sanders -- a distinguished Dallas educator, of whom we are all proud --~~ David Kearns + Secretary of Education Lamar Alexander ~~is~~ are committed to bringing about a quality revolution in our schools to cut back on bureaucracy while enhancing learning and teaching and parental involvement. We want to reinvent American schools -- in a

11-2-89 speech

revolution for educational quality no less dramatic than the revolution for improving business performance.

America's new commitment to quality would not have been possible without the pioneering work of strategic thinkers such as W. Edwards Deming. Four decades ago, Dr. Deming offered himself as a sort of one-man Marshall Plan in the war ruins of Japan. His common sense was "Made in America," and it inspired Japanese businesses to heights of excellence considered miraculous. Now at long last American businesses follow rigorous disciplines of continuous quality improvement as envisioned by such pathfinders as Dr. Deming. \\

Who's Who in Am.

And we owe so much to Malcolm Baldrige. Mac Baldrige was a rough-riding Renaissance figure -- the kind of man found only in America. \\ He was one of my dearest friends, and his untimely death four years ago still leaves me feeling a loss. \\

As Secretary of Commerce during the 1980s, Mac Baldrige worked hard to liberate American businesses from needless regulation. But much as he cherished economic freedom, he believed it was not worth much if companies failed to perform at their best. So Mac spent much of his time in the bully pulpit urging American business to pursue excellence. The National Quality Awards competition, now named in his honor, is one of Mac's greatest legacies. \\

WSJ 10-10-91 p.A3

Three small companies, each an electronics manufacturer, merited the 1991 Baldrige Award: Solectron Corporation of San Jose, California; Zytec Corporation of Eden Prairie, Minnesota;

and, of course, Marlow Industries of Dallas. All three winners prove that American enterprise can succeed in world-class competition involving the most sophisticated technologies and the most discerning customers. All three make America proud with their success in export markets. \\

I am proud to be with the men and women of Marlow Industries today, proud to congratulate you for navigating the "Baldrige Award Strait" on your map of dreams. \\\

Dallas Morning News 10-10-91 see file

And because Marlow supplies critical components for high-tech national defense systems, let me offer a special word of thanks for the brilliant contribution you made to the success of our troops and sailors and airmen in Operation Desert Storm. \\\

Marlow statement see file

Like all Baldrige Award winners, you now accept responsibility to share your ideas and experiences on quality improvement with thousands of other companies. You've already done good work developing benchmarks and lifting industry standards through the Texas Quality Consortium. \\ Now you're charged with a bigger mission: helping thousands of other businesses throughout the nation to chart their journeys to world class performance, helping them launch new worlds of opportunity and achievement. I wish you Godspeed. \\

Thank you, and God bless the United States of America.

\# # #

(Duggan/Simon)
October 30, 1991
Draft Four
Baldrige

PRESIDENTIAL REMARKS: BALDRIGE AWARD
MARLOW INDUSTRIES
DALLAS, TEXAS
FRIDAY, NOVEMBER 1, 1991

((Thank you. Thank you for that warm welcome. I can't imagine getting a more enthusiastic reception -- not even if I changed my name to Troy Aikman. [Cowboys QB])) \\

Ray [Marlow, chairman] and Chris [Witzke, president], and all the men and women of Marlow Industries and your families: I am honored to be your guest today. America is proud of your outstanding work in earning the Malcolm Baldrige National Quality Award. I am delighted we have yet another Texas businessman here, my friend Bob Mosbacher.

((Ray, I was impressed by the tour of your plant. I feel as though I've just gone through a crash course in dewpoint hydrometers and parametric amplifiers. I can barely pronounce them; don't expect me to understand them. \\ ))

I certainly want to compliment the makers of this splendid map that forms our backdrop. What a work of imagination: At first glance one might think it's a conventional map of the world. But a more careful inspection shows it is a symbolic picture of Marlow Industries' ambitious business goals and expectations. It's a whole world of your own making. \\

It reminds me of a remark by the great American revolutionary, Thomas Paine. As Americans fought the War for Independence -- which was a struggle for free enterprise as well as political freedom -- Paine said, "We have it in our power to begin the world over again." \\

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The quality revolution is driving bureaucracy out of our business organizations. Companies are doing away with stratification, leaving as little distance as possible between the most junior employee and the CEO. In this quest, employees at every level are enjoying more power, more incentive, more freedom to create, and more responsibility for their efforts.

America is improving the quality of its products and services with the keenest tools of statistical process control. The quality revolution topples barriers that used to isolate backroom "number crunchers" from the people who work the assembly lines and the service counters. We're learning how to prevent defects in the first place -- instead of correcting them later.

Most important, the quality revolution helps American companies to put customer satisfaction at the forefront. \\
Winning organizations know that customers don't want just the

best that one company can offer; they want the best that anyone in the world can offer. \\

Ray Marlow has described quite succinctly what the commitment to corporate quality means. He reports that the company's receivables and payables are timely, the profit sharing and taxes paid, the revolving bank debt paid routinely, and -- most important -- the company has cash. But Ray emphasizes that while these are the results, "they cannot be the goals in and of themselves. The goal must be quality." \\ Ray, I believe every CEO and every company in America would benefit by sharing your philosophy about effort and results. \\\

The new commitment to world-class excellence will make American businesses stronger than ever as we recover from the recession. \\ And the most important long-term indicators are favorable for recovery. The index of leading indicators has been steady or increasing for seven months; it is now 5 percent higher than in January. Interest rates are near their lowest in a decade and a half. Industrial production increased in September and rose by an annual rate of more than 6 percent in the third quarter. Manufacturing productivity rose at a 3.6 percent annual rate during the second quarter. And our first estimates have GNP rising 2.4 percent in the third quarter.

In this climate, one thing I'm determined not to do is to break the budget deal and open up the floodgates for congressional tax-and-spend politics. \\\ That's why I support an unemployment compensation bill that will comply with the budget accord -- and that's why I vetoed the unemployment compensation bill that irresponsibly tried to bust the budget. \\ I want to sign extended benefits legislation -- and we have a good proposal. But I won't sign a bill that breaks the spending constraints in the budget agreement. Why saddle every taxpayer and citizen with more federal spending when we can help those who need help and still spare the overtaxed citizen from the ravages of even larger federal deficits?

I am doing my level best in Washington to pursue the kind of economic policies that let companies like this one lead the way to quality. This means we will hold the line on spending. We'll work to get a capital gains tax cut that will create more jobs. We'll continue to trim needless regulation. And we'll resist the push for mandated benefits -- those one-size-fits-all solutions that politicians try to impose on problems that really come in all shapes and sizes. \\\

The potential of our quality revolution reaches far beyond anything that appears on a balance sheet. Take educating our kids for example. David Kearns led Xerox to win the Baldrige Award in 1989, and now he is in public service as our Deputy Secretary of Education. He and Secretary Lamar Alexander are working to reinvent American schools -- in an effort no less dramatic than the revolution for improving business performance.

Our quality revolution owes a deep debt to Malcolm Baldrige. Mac was a rough-riding Renaissance figure -- the kind of man found only in America. \\ He was one of my dearest friends, and his untimely death four years ago still leaves me feeling a loss.

As Secretary of Commerce during the 1980s, Mac Baldrige worked hard to liberate American businesses from needless regulation. But much as he cherished economic freedom, he believed it was not worth much if companies failed to perform at their best. So Mac spent much of his time in the bully pulpit urging American business to pursue excellence. The National Quality Awards competition, now named in his honor, is one of Mac's greatest legacies. \\

Three relatively small companies, each an electronics manufacturer, merited the 1991 Baldrige Award: Solectron Corporation of San Jose, California; Zytec Corporation of Eden Prairie, Minnesota; and, of course, Marlow Industries of Dallas. All three winners prove that American enterprise can succeed in world-class competition involving the most sophisticated technologies and the most discerning customers. All three make America proud with their success in export markets. \\

I am proud to be with the men and women of Marlow Industries today, proud to congratulate you for navigating the "Baldrige Award Strait" on your map of dreams. \\\

Now it's your mission to help other companies across the nation to chart their journeys to world class performance. I wish you Godspeed. \\

Thank you, and God bless the United States of America.

\# # #

MEMORANDUM OF CALL

Previous editions usable

TO: Bob

[X] YOU WERE CALLED BY— [ ] YOU WERE VISITED BY—

Craig Ports

OF (Organization)

[ ] PLEASE PHONE ▶ 340-4900 [ ] FTS [ ] AUTOVON

[ ] WILL CALL AGAIN [ ] IS WAITING TO SEE YOU

[ ] RETURNED YOUR CALL [ ] WISHES AN APPOINTMENT

MESSAGE

RECEIVED BY CBA | DATE 10-28 | TIME 6:3

63-110 NSN 7540-00-634-4018
☆ U.S. GPO: 1987—181-246/40025
STANDARD FORM 63 (Rev. 8
Prescribed by GSA
FPMR (41 CFR) 101—11.6

Marlow Industries
Nov. 1, time not decided
Dallas, TX
Marlow Industries site

Brief remarks -- 5 to 7 minutes on cards

Ray Marlow -- President and CEO

Marlow -- 160 employees; will do $12 million in sales this year; has 2 buildings: the main building and the West Wing [joke here]; Marlow manufactures cooling devices for electronic equipment such as Tomahawk missile, aircraft, aircraft carriers; they are industry leaders in military, telecommunications, medical instrumentation markets; has a small R&D group; sells in 39 countries and has 1 sales office in London.

Marlow is very employee-oriented. Employees are encouraged to strive for their best. The management style encourages employees to work out their own goals and structure their own departments. A recent internal survey found that 99% of employees say they enjoy their job.

Pres will take tour of West Wing then go outside main building. He will speak in front of a map banner behind him. The map will be a blown-up version of the mural hanging in Marlow's breakroom. The map (entitled Voyage to World Class . . . and Beyond) resembles a world map -- although the countries and seas and oceans are given names relevant to the journey Marlow has made in becoming a world class company. For example, the charted journey of the Marlow ship starts out at the Sea of Darkness and ends thus far cruising through the Baldridge Strait.

Marlow recycles most of their materials now and their chemicals; they no longer have landfill requirements.

All employees sign the Marlow Commitment to Quality Pledge (see info).

Employees will be wearing their Marlow t-shirts: I am committed to Quality and Marlow Industries.

PRE-ADVANCE/WALK-THRU QUESTIONNAIRE

EVENT: Marlow Industries

DATE: Nov. 1

TIME: Undecided — probably mid-day

LOCATION: Dallas, TX
(GIVE DETAILS) Marlow Industries site
Outside Main Bldg.

EXPECTED AUDIENCE:
(NUMBER AND COMPOSITION) 160 employees (plus their families if approved — number unconfirmed)

PRESS COVERAGE: Open

~~**DIAS PARTICIPANTS:**~~ Stage **PARTICIPANTS:** Ray Marlow + Wife Elizabeth
Sec. Mosbacher

EXPECTED PARTICIPATION BY MEMBERS OF CABINET/CONGRESSIONAL/ADMINISTRATION: Sec. Mosbacher

POTUS INTRODUCTION: Undecided — probably Ray Marlow

PERTINENT SPEECH TOPICS: R. Marlow mentioned employees would like to see that Pres recognizes their achievement.

REASON FOR EVENT: Business tie-in; Marlow Ind. first Dallas winner of Baldridge Award; Pres "wanted" to visit one winner — Marlow convenient for this trip.

PLEASE ATTACH PRE-ADVANCE/WALK-THRU CALL SHEET

Bob Simon
(202) 456-

City/State: Dallas, TX
Event: Marlow Industries
Date: Nov. 1, 1991

OFFICE OF PRESIDENTIAL ADVANCE
CONTACT SHEET

Name	Office	Phone Number
Presidential Advance Office		202/456-7565
Presidential Advance Fax Number		202/456-2820
Mel Lukens	WH Advance	202/456-7565
Kris Goodwin	"	" "
Bobby Carr	WH Press	" "
Mitch Ross	WH Communications	202 757 5430
Wayne Justice	Military Office/Coast Guard Aide to President	202 395 1747
Raymond Marlow	President/CEO (Marlow)	(214) 340-4900
Frances Keating	Secy to President (Marlow)	214/340-4900
Chris Witzke	Chief Opng Officer (Marlow)	214/340-4900
Elizabeth Marlow	Sect/Treas Marlow Ind	hm 214/771-9176 214/340-4900
Bruce Bowen	Secret Service - Pres. Prot. Division	202/395-4011
Pamela Jennett	Customer Service Mgr	612-2144 home 340-4900 work
Raymond McGovern	U.S. Secret Service - Dallas	214 767 8021
Michele Mix	WH Speechwriting	202 456-7750
Gordon Errington	White House Communications	(202) 757-5000
Dave Humphrey	USSS - Dallas	(214) 233-8319
Rob Creamer	Marine One Adv	703-640-2364
Lawrence Swicegood	W.H Advance	214 692 1522
Andy Foster	WH Political Affairs	202-456-6510
Julie Clark	Marlow Ind. (HR)	(214) 340-4900
George [illegible]	Marlow Ind. (Pur. & Facil.)	340-4900

Marlow Industries, Inc.
Thermoelectric Innovation Through Research

QUALITY FROM TOP TO BOTTOM

Marlow Industries' Total Quality Management System

Since 1986, Marlow Industries has been aggressively developing a Total Quality Management System that has now touched every aspect of our company's business operations.

Our system has continually evolved and matured, and will continue to do so, because an effective quality system is never finished. It must, **by its nature**, be ongoing - striving constantly for improvement, moving steadily toward an impossible standard of perfection.

Our experience has not been easy. I am convinced that companies such as ours have no choice but to implement a Total Quality Management System if they are to survive today's competitive pressures.

Who We Are and What We Do

In 1973, four colleagues and I founded Marlow Industries to design, develop, and manufacture thermoelectric cooling modules.

These solid state devices provide cooling, heating, or temperature stabilization without any moving parts.

They are used in a variety of applications, including:

*Infrared detectors
*Laser diodes
*Charged Couple Devices in Cameras and
*Computer Chips

But, most people are more likely to come in contact with these devices when they are used in:

*Small air conditioners
*Water coolers or
*Small refrigerators

In the future, they will become one of the keys to the commercialization of superconducting products.

Our current markets include telecommunications, military, and commercial applications.

Our corporate headquarters and manufacturing facility is in Dallas, Texas, in a 29,000 square foot plant. The company sells direct in the U.S. and in the United Kingdom, and throughout the rest of the Free World by agents and distributors for sales of about $13 million dollars annually.

As our organization expanded and matured, I became increasingly concerned about product quality issues. Gradually, I recognized that product quality was more than an issue of competition, it was - and is - a matter of corporate survival.

Some foreign companies have far more experience with structured quality systems than their U.S. counterparts. For instance, Japanese companies have been developing such programs for over twenty years. As quality becomes an ever more important issue in competitive situations, U.S. companies must respond or die.

The New Life

There is an emerging trend toward the selection of single source suppliers.

There are increasing numbers of customer-supplier partnerships.

Customers are working more closely with suppliers to identify and solve problems.

10451 Vista Park Road • Dallas, Texas 75238 • (214) 340-4900 • TWX 910-860-5161 • FAX 214-341-5212

Given these trends, if you are not selected **the** supplier in the **beginning** of a program, you may not get another chance.

More and more of the Fortune 500 companies, who are our customers, are concerned with their suppliers' product quality.

For example, in January, 1986, Hughes Aircraft's Santa Barbara Research Center conducted a two day meeting in our facility in which they told us how we would be evaluated as a participant in their "Blue Ribbon Supplier Program".

At this meeting, our middle and top management learned for the first time about Statistical Process Control, which is a way of quantifying business activities to define, identify, and correct potential problems.

I realized as never before that Quality had to be a way of life for our company and I had to do something to get our Quality System moving.

A False Start

For the next 5 months I tried without success to communicate my interest in quality to our personnel.

In May, 1986, I attempted to clarify my thinking and reach our personnel with what I called Marlow's Mottos:

1) Quality before quantity, but quantity not far behind.

2) If it's not right, don't use it.

3) My supervisor **will** answer my questions.

Each supervisor was given a notebook to collect questions during the week. Each week I met with the hourly personnel to:

1) Review the meaning of Marlow's mottos.

2) Recite the mottos as a group and

3) Answer the questions collected during the week.

After two months I realized my quality system was not working. It was the right philosophy, but the wrong approach.

Top and middle management were not a part of the system and therefore were not supportive.

Only I, as President, was representing management.

Back On Track

In May, 1987, Texas Instruments conducted a six hour meeting at our facility. For the first time I was exposed to a long term quality system, and was made aware of the Crosby College program in Winter Park, Florida.

The following month I met Warren Hogan through the American Electronics Association. Warren was then President of the electronics manufacturing company, Airborn, Inc. We began to discuss the concept of a Total Quality Management System.

I was hesitant to invest in extensive training programs such as Crosby College because previous short term off-site seminar experiences had not made significant impacts within our company.

Crosby College would cost too much money - if we failed.

That same month, my vice president of manufacturing attended an AEA meeting on "World Class Companies". He returned convinced that Marlow Industries should initiate a system to become a "World Class Company". It was clear to both of us that a key factor in becoming a World Class Company was a Total Quality Management System. After 16 months of cheerleading, I gained my first supporter inside the Company.

But I knew that a Total Quality Management System was too important to our success to stop there. I wanted a system that was affordable to a company of our size that would succeed. Because we knew other presidents of companies of our size felt the same way, Warren decided to organize a system that would spread the cost over a group of companies that would participate in a long-term project. He formed Hogan & Associates to coordinate the project among a number of small companies about the same size of ours that is now the Texas Quality Consortium. Our participation in the Consortium became the foundation of our Total Quality Management System.

In January, 1988, I attended a Rockwell International seminar in Richardson on how we would be evaluated as a Rockwell supplier. There I saw examples of Statistical Process Control with a clear message:

DO IT RIGHT TODAY, BETTER TOMORROW

Within six months Rockwell personnel from Anaheim, California, conducted a three day audit of our plant to evaluate our quality system progress. Their detailed inspection convinced me even further of the value of our participation in the Texas Quality Consortium $(TQC)^2$.

The Consortium uses the methods proven in Japan over three decades by Dr. W. Edwards Deming.

The system provides:

1) A structured method of achieving the goal of Total Quality Management.

2) A long term implementation schedule.

3) Training for varying numbers of our personnel.

4) An experienced trainer/consultant.

5) Networking with other companies' personnel with interests in a Total Quality Management System, and

6) A reporting system to share participants' progress.

Our Consortium group met monthly to hear Warren or one of his associates present Dr. Deming's and Crosby's concepts of a Total Quality Management System. We may send as many personnel as we desire, depending on the subject. We have sent as many as 40 people to one meeting to hear quality discussed by someone outside of Marlow Industries.

All company operations are now focused through the Total Quality Management System. Every department and business activity is affected. All employees participate in some fashion. We are now organized from top to bottom.

Every action we take is now motivated by a 28-word Quality Policy which states:

> For every product or service we provide, we will meet or exceed the customers' requirements, without exception. Our standard of performance is "Do It Right Today, Better Tomorrow".

Our Quality Pledge, which every employee is encouraged to sign as a voluntary act, personalizes our common goal. Each individual who commits to sign states simply:

> I pledge to make a constant, conscious effort to do my job right today, better tomorrow, recognizing that my individual contribution is critical to the success of Marlow Industries.

A Different Entity

As we have developed our Total Quality Management System, we have had to change and adapt as we have matured.

When we began, we developed an infrastructure of a council, committees, and teams to acquaint and involve every employee actively in the system. Once our workforce matured and our experience broadened, we undertook an evolutionary reorganization, simplifying our structure and providing more autonomy to our personnel to address and solve quality problems with fewer levels of supervision.

Our Total Quality Management Council coordinates Company Action Teams which addresses company-wide and inter-departmental issues, and Department Action Teams which focus on quality issues within their discrete units.

Membership of all groups is now fluid, with individuals participating as needed, leaving a group once their contribution is complete.

In essence, we have emerged from a period of learning about Total Quality Management Systems and putting our own system in place. We are now in a stage of developing implementation strategies to foster, maintain and improve the system we have developed.

Our receivables are timely.

Our payables are timely.

Our taxes are paid.

Our profit sharing is paid.

Capital equipment has been bought and paid.

We have reduced our line of credit to zero.

We pay our revolving bank debt routinely.

And most important: We have cash.

Where We Are Headed

Make no mistake . . . . These were not the goals of our Total Quality Management System. They are the results. They cannot be goals in and of themselves. The goal must be quality.

Quality of materials . . .

Quality of production . . .

Quality of performance.

How long does it take to implement a Total Quality Management System? Based on our history and knowledge of other companies both larger and smaller than Marlow Industries, it takes one year per level of management.

We now understand that quality means meeting the customers' requirements, and that quality comes from prevention.

We have allocated a tremendous amount of our resources to the Total Quality Management System concept. And that investment has paid off.

It provided a structured system that empowered all of our employees with a method for continuous improvement toward our never ending quest for customer satisfaction. In particular our market share has increased during the past three years both in the U.S. and Japan.

I am convinced that the success of your companies depends on your present and future commitment to the Total Quality concept.

What Is A World Class Company

If you consider one question today, I'd like it to be this: Are you interested in upping the ante to become a World Class Company? I personally don't think it's enough to be a Total Quality Company. Today's international competition demands an even higher standard; it demands that we become World Class Companies, capable of competing and winning internationally. A World Class Company is one which is solidly efficient with well-trained people who obtain satisfaction because they understand how their work and the quality of their work is integral to the company's purpose and strategic goals.

At one of my company meetings, I told everyone we needed a Quality Policy and a Quality Pledge, so that we would have a definitive goal. When I first used the expression "World Class Company" at a meeting, one of our employees asked, "How do we know when we get there?"

It took me almost a year until I had an answer for him. We'll be a World Class Company when we meet the rigorous standards implied for winning the Malcolm Baldrige National Quality Award.

What Is The Malcolm Baldrige National Quality Award?

We applied for this prestigious award in April, 1991. Named for the former Secretary of Commerce Malcolm Baldrige, the annual award was first given in 1988. It is given to publicly- or privately-owned businesses incorporated and located in the United States and is managed by the United States Department of Commerce.

If deserved, up to two awards are given in each of three categories:

o Manufacturing Companies

o Service Companies

o And, Small Businesses such as ours.

After we had been in Warren Hogan's $(TQC)^2$ program for about 6 months, I thought we qualified to apply for the Award in 1989. As my education in Total Quality Management Systems progressed, I realized we were not qualified to apply in '89, and we had a major commitment to make as a company even to be eligible to apply in 1991.

Once we made the decision to compete, we had a new customer. The person who makes the final selection among the applicants for the Baldrige Award is the President of the United States.

The fact that the selection is made at this level of our government says to me that the standards are the very highest in the land. It moves the bar up to an all new high. It makes the challenge the most exciting in my professional career.

Organization To Win The Baldrige Award

We organized Marlow Industries to win the Baldrige Award. The Total Quality Management Council consisting of 13 people at the present time, includes our officers, and managers. It is through this Council that I manage Marlow Industries.

As shown on the Total Quality Management System chart, there are two primary standing committees that report to the Council; our Strategic Business Plan Committee, and the Baldrige Award Committee.

The Strategic Business Plan Committee, chaired by our Chief Operations Officer, defines our 5 Year business objectives.

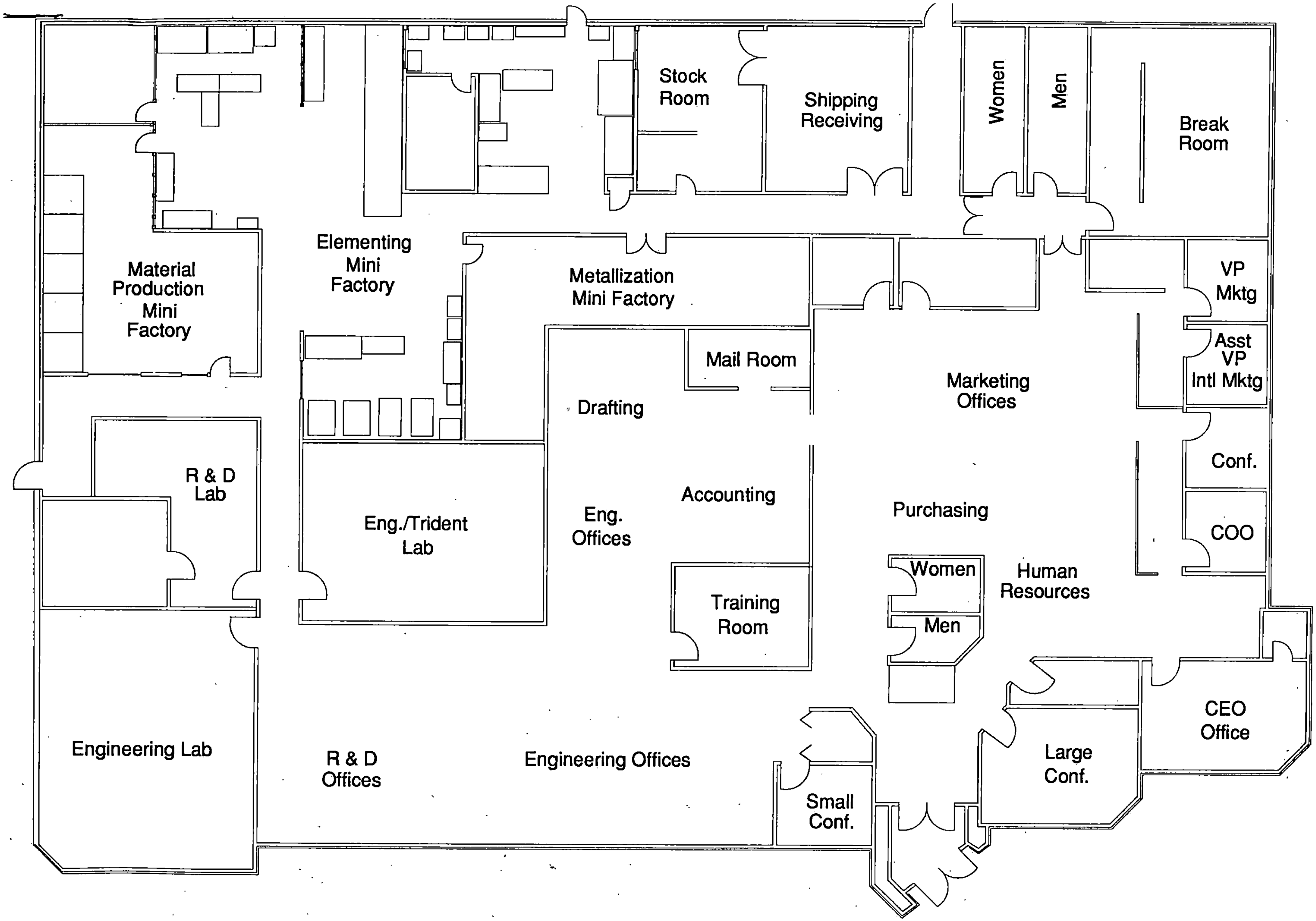
I chair the Baldrige Award Committee. This Committee defined Baldrige Action Teams similar in scope to the Corporate Action Teams under the TQM Council. It is through the efforts of this Committee that Marlow Industries will win the Baldrige Award in 1991.

How Can Marlow Industries Afford This?

By now, many of you are probably saying to yourselves, "It's all very well to talk about implementing a system like this, but how can a small business afford to spend this kind of money?"

My response begins with a counter question: If you don't use the Baldrige Award as a tool to manage your company, what will you use instead? Any system that would help you achieve the kind of results we expect to achieve would take at least as much time and energy as this one.

We intend to be one of the recipients of a Baldrige medal in the November 1991 award ceremony. It is our goal to win, but even more important than winning is that the Baldrige Award is guiding us in the transformation of our company -- a process that is occurring on a daily if not an hourly basis. Perhaps just as importantly, it is helping us redefine our own individual standards of excellence. I encourage you to join me in using this invaluable tool to help make your company a World Class Company.



Marlow Industries Main Building Facility

9-23-91

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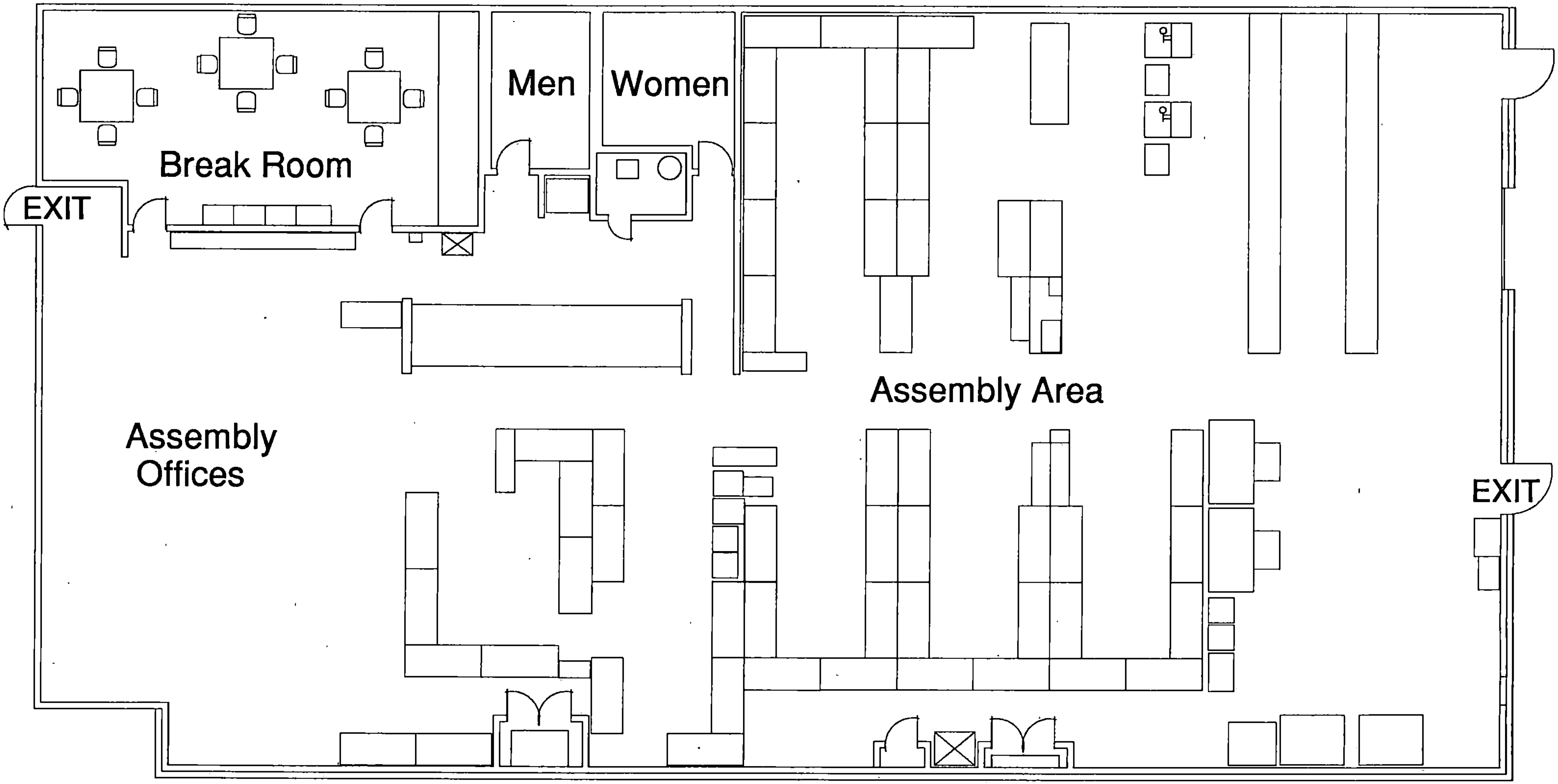


Marlow Industries West Wing Facility

9-23-91

Laura

GB Jr.

Bobbie ~~Holt~~ Hunt

Ray Hunt

dinner chm.

ive. Roman Catholic. Clubs: Granite, Toronto, University (pres. (Toronto); Hamilton Golf and Country (Ont.); St. Andrews, Loxlee (Fla.). Office: RBC Dominion Securities Inc, Commerce Ct S PO l, Toronto, ON Canada M5L 1A7

'ENIL, DOMINIQUE, art collector, philanthropist; b. Paris, Mar. 23, came to U.S., 1941, naturalized, 1967; d. Conrad and Louise (Delpech) mberger; m. John de Menil, May 9, 1931 (dec.1973); children: Christ Adelaide, George, Francois, Philippa. B.A., U. Paris, 1927, postgrad. ath. and physics. Art collector 1945—; dir. Inst for Arts Rice U., on. from 1968; organizer exhbns. 1964—. Trustee Mus. Fine Arts, on.; pres. Menil Found., Rothko Chapel, Georges Pompidou Art and re Found., Menil Collection Mus. Recipient Nat. medal of Arts, 1986. Menil Collection 1515 Branard St Houston TX 77006*

ERATH, NICHOLAS JAY, III, sociology educator; b. Boston, Nov. 36; s. Nicholas J. and Helen Louise (Titus) D.; m. Judith Wood Richie, 25, 1960; children: Loren Roberts, Peter Wells, Benjamin Bur-. AB magna cum laude, Harvard U., 1958; MA, U. Calif., Berkeley, PhD, 1964. Instr. to prof. sociology U. Wis., 1962-72; exec. officer Sociol. Assn., Washington, 1970-72; prof., chmn. sociology U. Mass., rst, 1972—. Author: Social Class in American Protestantism, 1965 R.A. Peterson) System, Change and Conflict, 1967, (with P.E. Ham- Religion in Social Context, 1968, (with M.T. Aiken and G. Marwell) mics of Idealism, 1971, A Tottering Transcendence, 1973, (with K.F. ssler and O.N. Larsen) Social Policy and Sociology, 1974, (with G. ell) Sociology: Perspectives and Applications, 1976; book rev. editor: Sociol. Rev., 1965-68. Rsch. fellow, grantee Danforth Found., 1965, H. 1960-62, New World Found., 1966; Lilly Endowment grantee for h-state rsch., 1983-89. Mem. Am. Sociol. Assn. (chmn. publs. com. 77, chmn. endowment com. Am. Sociol. Found. 1984-88), Eastern l. Soc. (v.p. 1975—), Soc. for Sci. Study Religion (coun. 1969-71), U. Amherst Nickwits (fixtures sec.). Democrat. Home: 30 Harris ntain Rd Amherst MA 01002

IERRITT, TED C., microprocessor company executive; b. Klamath Oreg., Mar. 14, 1932; s. Theodore Albert and Florence Fern (Harris) m. Mary Louise Mills, Aug. 21, 1952 (div. 1963); children: Diane, J. Douglas; m. Vonda L. Doane, Feb. 14, 1969; 1 child, Bradley. BBA, mento State U., 1954. CPA, Calif. Acct., Johnson & Miller, Sacra- Calif., 1955-63; data processing mgr. Sacramento Savs. and Loan, -72, controller, sr. v.p., 1973-80; dir., v.p. mfg. ISC Systems Corp., ane, Wash., 1980-81, exec. v.p., chief ops. officer, pres., 1981—, chmn., exec. officer, 1986-89; vice chmn. ISC-Bunker Ramo Corp., Spokane, —; bd. dirs. Sacramento Savs. & Loan, Inter Innovation LeFebure, —. Office: ISC Bunker Ramo Corp Box TAF C-8 Spokane WA 99220

IERS, JACQUES, hockey league coach; b. Montreal, Que., Can., Aug. 1944; s. John Demers and Marie Bergeron; m. Linda Stone, June 24, children: Brandy, Stefanie, Jason. Student, Cote St. Luc High Sch., treal. Data processor IBM, Montreal, 1977; coach Que. Nordiques, 83, St. Louis Blues, NHL, 1983-86, Detroit Red Wings, 1986—. pient Spirit of St. Louis Bus. Community award, 1984, award, 1984. e: Detroit Red Wings 600 Civic Center Dr Detroit MI 48226*

IETRION, JAMES THOMAS, art museum director; b. Middletown, July 10, 1930; s. Tom and Susie (Tsifiklis) D.; m. Barbara Parrish, 1 child, Elaine. Hon. doctorate, Simpson Coll., 1984. Curator adena Art Mus., Calif., 1964-66; dir. Pasadena Art Mus., 1966-69, Des nes Art Ctr., 1969-84, Hirshhorn Mus. & Sculpture Garden, Wash- on, 1984—; mem. Mus. adv. panel Nat. Endowment for Arts, 1973-76, hmn., 1974-76; mem. IRS Art Adv. Panel, 1983-86. Mem. art adv. panel Nat. Bank Chgo. Mem. Assn. Art Mus. Dirs. (treas. 1976-77, pres. 80). Office: Hirshhorn Mus-Sculpture Garden Independence Ave at 8th W Washington DC 20560

IETRIUS, JAMES KLEON, classicist, educator; b. Chicopee Falls, Aug. 23, 1924; s. James Demetrius and Bess Stephens. Student, U. 1945, U. N.D., 1946-47; B.A., U. Iowa and Bklyn. Coll., 1948; M.A., ambia U., 1949, postgrad., 1950-58; Ph.D. (hon.), WU, 1982; hon. ee, Madras, India. Instr. Greek, Spanish, Italian Iona Coll., 1953-59; prof. Spanish, ancient history Widener Coll., 1959-62; asst. prof. nish Wash. Coll., 1962-63; asso. prof. Greek and Spanish Bloomfield 1963-68; vis. prof. fgn. langs. St. Francis Coll., 1971-72; prof. ancient modern langs. Touro Coll., 1972; research in Spain and Latin Am., —; chmn. English and fgn. lang. dept. Interboro Jr. Coll., N.Y.C.; er U. Ky., 1958; honored speaker, Barry Chase Meml. lectr. The an Concept of Education and Its Meaning to Us Today Bloomfield 1968, The Originality of the Greek Genius Harvard U., 1986—; hon. ter Unification Theol. Sem., 1985, New Paltz, 1985, Princeton U., 1987, barton Oakes, Washington, 1987. Author: Greek Scholarship in Spain Latin America, 1966; monographs An Essay on Greek Influences on nish Literature, 1961, Los Griegos en Espana, 1962, A Bibliography of k Studies in Spain, 1962, Nikos Kazantzakis in Spain, 1968, (with Dr. Leon) Spanish Grammar Explained, 1972, Modern Greek Poetry, 1974, er Europe's First Humanist, 1974, S. They Thought Theocritus Was 1985; The Greek Genius, 1986, Romanticism and the Greeks, 1986; nnist: Grecian World, 1961—; numerous articles and studies and notes td. to Folia Humanistica, Spain, St. Francis Bull., Greek Gazette Jon, Boletin de estudios helenicos, Spain, Greek Star, Slavic Rev. Sofia Oggi, Balkan Studies; book rev. editor, mem. editorial bd.: nerous articles and studies and notes contbd. to Hellenic Times, 1974—. pient awards for excellence in teaching, student bodies in Bloomfield 1968, awards for excellence in teaching, student bodies in St. Francis 1972; Fellow Athens, Greece, 1977. Mem. Classical Assn. Spain, enic Soc. London, Royal Inst. Philosophy (Eng.), Classical Assn. Spain, nat. Hispanist Assn., Am. Assn. Teachers of Spanish and Portuguese, P. Medieval Soc. Am., Am. Classical League, Soc. Ancient Greek sophy, Alpha Sigma Phi. *The guiding philosophy of my life has always Homeric Humanism. When it is translated into every day terms, this sophy embodies the thought that one must seek and strive after excel- in everything one does. The individual must be highly individualistic must constantly pursue knowledge. Good teachers in the past roamed ely and defiantly afield, journeying through all of Western culture ng connections between one subject area and another. Their goal was the training of specialists, but of humanists able to move gracefully in the spacious and orderly realm of learning.*

IETRY, JAMES STEVE, electrical engineering educator, consultant; b. field, Mass., Sept. 4, 1936; s. Steve and Bessie (Giftos) D.; m. Sally Ann llen, June 16, 1962; children—Sara, Chrysanthe, Athena. B.S.E.E., ester Poly. Inst., 1958, M.S.E.E., 1960; Ph.D., Naval Postgrad. Sch., terey, Calif., 1964. Asst. prof. elec. engring. Naval Postgrad. Sch., 1964- asso. prof. Worcester Poly. Inst., Mass., 1971-75; prof. Worcester Poly. 1975—, chmn. div. interdisciplinary affairs, 1975-85, assoc. chmn. dept. engring., 1986—, sec. of faculty, 1988—; cons. U.S. Navy, Washington, 66, Litton Sci. Support Lab, Fort Ord, Calif., 1966-70, Hagglund As- Worcester, 1983—; owner Wachusett Engring. Cons., 1985—. Editor Project Abstracts Interactions (annual); contbr. articles to profl. jours. chmn. planning bd. Town of Holden, Mass., 1972-81, mem., chmn. selectmen, 1981-88; bd. dirs. Central Mass. Health Systems Agy., 1982- pres., 1986; chmn. CMHSA Project Rev. Com., 1983-86. Systems design NASA-Am. Soc. Engring. Edn., Stanford U., 1968, 70. Mem. IEEE, Engring. Edn., AAAS, Am. Assn. Higher Edn., Sigma Xi, Tau

1959, Formen des Realismus: Theodor Fontane, 1964, German Post-War Literature, 1970, After The Fires, 1986. Decorated Comdr.'s Cross of Order of Merit (Federal Republic of Germany); recipient Golden Goethe medal Federal Republic of Germany, 1971; Guggenheim fellow, 1965-66. Mem. PEN clubs in U.S., Germany, Austria. Office: Yale U Dept Germanic Langs and Lits PO Box 18A-Yale Sta New Haven CT 06520

DE MEUSE, DONALD HOWARD, paper products manufacturing executive; b. 1936. With Ft. Howard Co., Green Bay, Wis., 1959—; v.p. ops. 1977-79, exec. v.p., from 1979, now pres., dir.; chmn. elect Wis. Pape Coun. Exec. Com. Office: Ft Howard Corp 1919 S Broadway Box 19130 Green Bay WI 54307

DE MICHELE, O. MARK, utility company executive; b. Syracuse, N.Y., Mar. 23, 1934; s. Aldo and Dora (Carno) De M.; m. Faye Ann Venturin, Nov. 8, 1957; children: Mark A., Christopher C., Michele M., Julianne; m. Barbara Joan Stanley, May 22, 1982; 1 child, Angela Marie. BS, Syracuse U., 1955. Mgr. Seal Right Co., Inc., Fulton, N.Y., 1955-58; v.p., gen. mgr. L.M. Harvey Co. Inc., Syracuse, 1958-62; v.p. Niagara Mohawk Power, Syracuse, 1962-78; v.p. Ariz. Pub. Svc., Phoenix, 1978-81, exec. v.p., 1981-82, pres., chief exec. officer, 1982—, also bd. dirs.; bd. dirs. Am. West Airlines; dir. Pinnacle West Capital Corp. Pres. Jr. Achievement, Syracuse, 1974-75, Phoenix, 1982-83, United Way of Central N.Y., Syracuse, 1978, Ariz. Opera Co., Phoenix, 1981-83, Phoenix Symphony, 1984-86, United Way of Phoenix, 1985-86, Ariz. Mus. of Sci. and Tech., 1988—; chmn. Valley of Sun United Way, 1984-86, Phoenix Commn. on Ednl. Excellence, 1987—, Ariz. Arts Stabilization Fund. Named Outstanding Young Man of Yr. Syracuse Jaycees, 1968. Mem. Phoenix C. of C. (chmn. bd. 1986-87). Republican. Clubs: Phoenix Country, Ariz. (Phoenix). Home: 1040 E Osborn Rd Phoenix AZ 85014 Office: Ariz Pub Svc Co 400 N 5th St Phoenix AZ 85036

DE MICOLI, SALVATORE, non-ferrous metals commodity executive; b. Pieta, Malta, May 21, 1939; came to U.S., 1954; s. Anthony and Jane (Camilleri) De M.; m. Irma L. Gil, Sept. 25, 1966; children: Mark, Marisa, Martin. Asst. sec. AMAX/Ametalco Inc., N.Y.C., 1956-72; v.p. N.C. Trading Co. Inc., N.Y.C., 1972-73; exec. v.p. Cerro Sales Corp., N.Y.C., 1973-89; dir. copper trading Philipp Bros., Inc., N.Y.C., 1989—; bd. govs. Commodity Exchange Inc., N.Y.C., 1982—. Clubs: Copper (N.Y.C.). Home: 286 Bayview Ave S Massapequa NY 11758 Office: Philipp Brothers Inc 1221 Ave of Americas New York NY 10020

DEMIERI, JOSEPH L., manufacturing company executive; b. N.Y.C., Aug. 31, 1940; s. Leo A. and Frances (Garone) DeM.; m. Anne Patricia McCue, May 15, 1965. B.B.A., Tex. A&M U., 1962. C.P.A., N.Y. With Peat, Marwick, Mitchell & Co., N.Y.C., 1962-68; v.p., controller City Investing Co., N.Y.C. and Beverly Hills, Calif., 1968-82; exec. v.p. Motown Industries, Los Angeles, 1982-84; chmn., chief exec. officer Calif. Archtl. Millworks Corp., Pacoima. Mem. AICPA, Fin. Execs. Inst. Home: 6259 Ebbtide Way Malibu CA 90265 Office: 13576 Desmond St Pacoima CA 91331

DE MILLE, AGNES, choreographer. d. William Churchill and Anna (George) de M.; m. Walter F. Prude, June 14, 1943; 1 child, Jonathan. A.B. cum laude, U. Calif.; Litt.D. (hon.), Mills Coll., 1952, Russell Sage Coll., 1953, Smith Coll., 1954, Western Coll., 1955, Hood Coll., 1957, Northwestern U., 1960, Goucher Coll., 1961, Clark U., 1962, UCLA, 1964, Franklin and Marshall, 1965, Western Mich. U., 1967, Nasson Coll., 1971; L.H.D., Dartmouth Coll., 1974, Duke U., 1975, U. N.C., 1980, NYU, 1981. Dance recitalist U.S., Eng., France, Denmark, 1928-42; choreographer and dancer The Black Crook, 1929; choreographer (film) Romeo and Juliet, 1936; (musicals) Nymph Errant, 1933, Hooray for What, 1937, Oklahoma, 1943, One Touch of Venus, 1943, Bloomer Girl, 1944, Carousel, 1945, Brigadoon, 1947, Gentlemen Prefer Blondes, 1949, Paint Your Wagon, 1951, The Girl in Pink Tights, 1954, Goldilocks, 1958, Juno, 1959, Kwamina, 1961; (ballets) OBeah Black Ritual, 1940, Three Virgins and a Devil, 1942, Drums Sound in Hackensack, 1941, Rodeo, 1942, Tally-Ho, 1944, Fall River Legend, 1948, The Harvest According, 1952, Oklahoma (film), 1955, The Wind in the Mountains, 1965, The Four Mary's, 1965, The Informer, 1988; choreographer, dir. Allegro, 1947; dir. Rape of Lucrecia, 1949, Out of this World, 1950, Come Summer, 1969; choreographer (musical) 110 In the Shade, 1963; head Agnes de Mille Dance Theatre, presented by S. Hurok, 6 mos. tour, 126 cities, 1953-54, Agnes de Mille Heritage Dance Theater, 1973, 74, Conversations About the Dance, 1974, 75, Omnibus lectrs. and ballets, 1956-57; choreographer for Ballet Russe de Monte Carlo, 1942, Royal Winnipeg Ballet, 1972; author: Dance to the Piper, 1952, And Promenade Home, 1958, To A Young Dancer, 1962, The Book of the Dance, 1963, Lizzie Borden Dance of Death, 1968, Dance in America, 1970, Russian Journals, 1970, Speak to Me, Dance with Me, 1974, Where the Wings Grow, 1978, America Dances, 1980, Reprieve, 1981. Contbr. to McCalls, Atlantic Monthly, N.Y. Times mag., Vogue, Good Housekeeping, Esquire, Horizon mags. Recipient N.Y. Cirtics prize, 1942-46, Donaldson award, 1943-47, Madamoiselle Merit award, 1944, Antoinette Perry award, 1947, 62, Lord and Taylor award, 1947, Dancing Masters award of merit, 1950, Dance Mag. award, 1957, Capezio award, 1966, Handel award Mayor N.Y.C., 1975, Kennedy award Pres. U.S., 1980, Commonwealth award in dramatic arts, 1980, Nat. Medal of Arts, 1986; named Woman of Yr. Am. Newspaper Woman's Guild, 1946, named to Theatre Hall of Fame, 1973; Agnes de Mille Theatre, N.C. Sch. Arts, Winston-Salem named in her honor, 1975. Mem. Soc. Stage Dirs. and Choreographers (pres. 1965-66). Office: Harold Ober Assocs 40 E 49th St New York NY 10017

DEMING, DONALD LIVINGSTON, lawyer; b. Ahmednagar, India, July 30, 1924; s. Wilbur Stone and Elsie Cox (Smith) D.; m. Meleanor Lazo, July 7, 1951; children—David Hepburn, James Lazo, Robert Livingston. A.B., Yale U., 1947, LL.B., 1950. Bar: N.Y. 1951. Assoc. Chadbourne, Parke, Whiteside & Wolff (now Chadbourne & Parke), N.Y.C., 1950-51, 53-60; ptnr. Chadbourne, Parke, Whiteside & Wolff (now Chadbourne & Parke), 1960—; dir. twelve U.S. subs. of Hawker Siddeley Group PLC. Village justice Village of Lloyd Harbor, N.Y., 1963-77, trustee, 1977-78. Served to 1st lt. U.S. Army, 1943-46, ETO, 51-52. Mem. ABA, Assn. Bar City of N.Y., N.Y. Lawyers for Pub. Interest, Inc. (chmn. bd. 1984-86). Republican. Episcopalian. Clubs: Hemisphere (N.Y.C.); Piping Rock (Locust Valley, N.Y.). Home: 36 Matinecock Farms Rd Glen Cove NY 11542 Office: Chadbourne & Parke 30 Rockefeller Plaza New York NY 10112

DEMING, FREDERICK LEWIS, banker; b. Des Moines, Sept. 12, 1912; s. Fred Kemp and Erva Pearl (Smyres) D.; m. Corinne Inez Wilson, Feb. 4, 1935; children: Frederick Wilson, Richard Louis. A.B., Washington U., St. Louis, 1934, M.A., 1935, Ph.D., 1941. Mgr. research dept to 1st v.p. Fed. Res. Bank, St. Louis, 1941-57; pres. Fed. Res. Bank, Mpls., 1957-65; under-sec. for monetary affairs U.S. Dept. Treasury, Washington, 1965-69; gen. ptnr. Lazard Freres & Co., N.Y.C., 1969-71; pres. Nat. City Bancorp., Mpls., 1971-82; dir. Nat. City Bancorp. Trustee Washington U., 1966—; trustee Macalester Coll., 1959—, Endowment Fund, ARC, Washington, 1965-86. Democrat. Clubs: Minneapolis, Minikahda, Met, Cosmos. Home: 4235 E Lake Harriet Blvd Minneapolis MN 55409

DEMING, FREDERICK WILSON, economist, banker; b. St. Louis, Dec. 29, 1935; s. Frederick Lewis and Corinne Inez (Wilson) D.; m. Lynne Eve Anken, Mar. 24, 1960; children: Susanne Lyn, Frederick Lawrence. B.A., Princeton U., 1957; M.A., Yale U., 1958. With Fed. Res. Bank of N.Y., 1961-71; sr. staff economist Council Econ. Advisers, 1968; exec. dir. Commn. Mortgage Interest Rates, 1969; spl. asst. to Sec. of HUD, 1970-71; sr. v.p., economist Chem. Bank, N.Y.C., 1971—. Home: 24 Colt Rd Summit NJ

Can., Insley Mfg. Co.; mem. adv. bd. U. Colo. Bus. Sch. Author: Characteristics of an Effective Management Control System in an Industrial Organization, 1968. Chmn. for Md., Harvard U. Bus. Sch. fund raising drive, 1969-72; bd. dirs. Md. YMCA, 1970-72, Friends Winston Churchill Meml., 1977, T.O.V.; mem. bd. advisors Aspen Found., Environ. Def. Fund.Rocky Mountain. Recipient Disting. Alumni award U. Colo., 1985 Rosenfeld scholar, 1952-56; grantee Ford Found., 1959-62. Mem. Young Pres. Orgn., Chief Execs. Orgn. (bd. dirs.), World Bus. Council, Assn. Home Appliance Mfrs., Balt. C. of C. (life), U. Mo. Scholarship Assn., Beta Gamma Sigma (Key award 1955), Beta Alpha Psi (ann. award 1956). Clubs: Harvard Bus. Sch. (past pres. Md.), Columbia Coll. Medallion. Home: 1920 S Larkspur Dr Golden CO 80401 Office: 1801 N Stadium Blvd Columbia MO 65201

DEMING, W(ILLIAM) EDWARDS, statistics educator, consultant. BS, U. Wyo., 1921, LLD (hon.), 1958; MS, U. Colo., 1924, LLD (hon.), 1987; PhD, Yale U., 1928; ScD (hon.), Rivier Coll., 1981, Ohio State U., 1982, Md. U., 1983, Clarkson Inst. Tech., 1983; D in Engring. (hon.), U. Miami, 1985; LLD (hon.), George Washington U., 1986, D in Engring. (hon.), 1987; DSc (hon.), U. Colo., 1987, U. Ala., 1988, U. Oreg., 1989. Instr. engring. U. Wyo., 1921-22; asst. prof. physics Colo. Sch. Mines, 1922-24, U. Colo., 1924-25; instr. physics Yale U., 1925-27; math. physicist USDA, 1927-39; adviser in sampling Bur. of Census, 1939-45; prof. stats. NYU Grad. Sch. Bus. Adminstrn., N.Y.C., from 1946; Fordham U., 1988, U. Ala., 1989, Oreg. State U., 1989; Disting. prof. in mgmt. Columbia U., 1986—; cons. research, industry, 1946—; statistician Allied Mission to Observe Greek Elections, 1946; cons. sampling Govt. India, 1947, 51, 71; adviser in sampling techniques Supreme Command Allied Powers, Tokyo, 1947-50, High Commn. for Germany, 1952, 53; mem. UN Sub-Commn. on Statis. Sampling, 1947-52; lectr. various univs., Germany, Austria, 1953, London Sch. Econs., 1964, Institut de Statistique de U. Paris, 1964; cons. Census Mex., Bank of Mex., Ministry Economy Mex., 1954, 55; cons. Statistisches Bundesamt, Wiesbaden, Fed. Republic Germany, 1953, Central Statis. Office Turkey, 1959—, China Productivity Ctr., Taiwan, 1970, 71; Inter Am. Statis. Inst. lectr., Brazil, Argentina. Author: Statistical Adjustment fo Data, 1943, Some Theory of Sampling, 1950, Statistical Design in Business Research, 1960, Quality, Productivity, and Competitive Position, 1982, Out of the Crisis, 1986; contbr. numerous articles to profl. publs. Decorated 2d Order medal of the Sacred Treasure (Japan), 1960; elected Most Disting. Grad., U. Wyo., 1972; recipient Taylor Key award Am. Mgmt. Assn., 1983, Nat. medal tech., Pres. of U.S., 1987, Edison award, 1989; enshrined in the Engring. and Sci. Hall of Fame, 1986. Fellow Am. Statis. Assn., Royal Statis. Soc. (hon.), Inst. Math. Stats.; mem. Am. Soc. Quality Control (hon. life, Shewhart medal 1955), Internat. Statis. Inst., Philos. Soc. Washington, World Assn. Pub. Opinion Research, Market Research Council, Biometric Soc. (hon. life), ASTM (hon.), Union Japanese Scientists and Engrs. (hon. life) (tchr. and cons. to Japanese industry 1950-52, 55, 60, 65— honored in establishment of Deming prizes), Japanese Statis. Assn. (hon. life), Deutsche Statistische Gesellschaft (hon. life), Operations Research Soc. Am., Nat. Acad. Engring., Dayton Hall of Fame. Home and Office: 4924 Butterworth Pl Washington DC 20016

DEMING, WILLIS RILEY, business executive; b. Ada, Ohio, Nov. 28, 1914; s. Cliffe and Okla (Riley) D.; m. Dorothy Arline Hill, 1950 (div. 1971); children: Susan Elizabeth, Deborah Anne, David Riley; m. Constance S. Mori, 1971 (div. 1986). B.A., Ohio State U., 1935, J.D., 1938. Bar: Ohio 1938, Calif. 1947, D.C. 1957. Pvt. practice Columbus, Ohio, 1938-39; casualty claim examiner Am. Surety Co., N.Y.C., 1939-41; chief bds. and claims rev. br. San Francisco Port of Embarkation, 1946-47; mem. Treadwell and Laughlin, San Francisco, 1947-54; mem. Brobeck, Phleger & Harrison, San Francisco, 1954-56, Washington, 1956-60; pvt. practice Washington, 1961-62; with Matson Nav. Co., San Francisco, 1962-71, 74—; now sr. v.p., gen. counsel Matson Nav. Co.; v.p., sec., gen. counsel Alexander & Baldwin, Inc., Honolulu, 1968-74. Served to lt. col. AUS, 1941-46; col. U.S. Army, ret. Mem. ABA, Fed. Bar Assn., State Bar Calif., D.C. Bar, Hawaii Bar Assn., San Francisco Bar Assn., Maritime Law Assn.. Methodist. Clubs: World Trade (San Francisco); Oahu Country (Honolulu). Home: 5649 Country Club Dr Oakland CA 94618 Office: Matson Nav Co PO Box 7452 San Francisco CA 94120

DEMLING, ROBERT HUGH, surgeon, researcher; b. Grand Rapids, Mich., July 17, 1943; s. Gerry James and Margaret Helen (Boucher) D.; m. Patricia Ann Huber, Nov. 6, 1971; children: Jill, Kate. BS, Notre Dame U., 1965; MD, Med. Coll. Wis., 1969. Diplomate Am. Bd. Surgeons (cons. 1986—). Intern U. Calif., San Francisco, 1969, resident, 1970-76; dir. Burn Ctr. U. Wis., Madison, 1976-79, U. Calif., Davis, 1979-82; dir. Burn-Trauma Ctr. Brigham and Women's Hosp., Boston, 1982-89; prof. surgery Harvard Med. Sch., Boston, 1982—; dir. Burn-Trauma Ctr., Boston, 1982—; cons. NIH, 1984—. Author: 2 books; contbr. numerous articles to profl. publs. Mem. ACS (chmn. pre and post operation care com. 1987—), Univ. Surgeons (treas. 1986-89). Republican. Roman Catholic. Avocations: rugby, weightlifting, martial arts. Home: 15 Bakers Hill Weston MA 02193 Office: Longwood Area Trauma-Burn Ctr 75 Francis St Boston MA 02115

DEMME, JONATHAN, director, producer, writer; b. Rockville Centre, N.Y., Feb. 22, 1944; m. Joanne Howard; 1 child, Ramona. Ed., U. Fla. With Avco Embassy Films, 1966, Pathe Films, 1966-67; with publicity dept. United Artists, 1968-69; writer Film Daily, 1966-68. Co-screenwriter, dir. (film) Hot Box; screenwriter; dir. (films) Caged Heat, 1974, Crazy Mama, 1975, Fighting Mad, 1976, Citizens Band, 1977 (later released as Handle with Care), Last Embrace, 1979, Melvin and Howard, 1980 (Best Dir. award), Swing Shift, 1983, Married to the Mob, 1988, The Silence of the Lambs, 1990; (TV movie) Who Am I This Time?, 1982; (documentary film) Stop Making Sense, 1984; also various music videos; co-producer, dir. (films) Something Wild, 1986, Married to the Mob, 1987, The Silence of the Lambs, 1990; (video) Konbir, 1989; producer (album) Konbir: Burning Rhthms of Haiti, 1989/. Mem. Dirs. Guild Am. Home: 225 Central Park W #503 New York NY 10024 Office: Lee Winkler Global Bus Mgmt 9000 Sunset Blvd Ste 1115 Beverly Hills CA 90069 also: care Bob Bookman Creative Artists Agy 1888 Century Park E Los Angeles CA 90067

DEMMER, WILLIAM ROY, engineering executive; b. Newark, Sept. 30, 1933; s. William and Lillian A. (Yaeck) d.; m. Marie F. August, June 11, 1955; children: Karen, Nancy, Laurie, Daniel. BSEE, N.J. Inst. Tech., 1955. Group mgr. devel. div. IBM, Poughkeepsie, N.Y., 1955-72; v.p. system devel. Telex Computer Prodn., Tulsa, 1972-73; v.p. mid-range systems Digital Equipment Corp., Boxboro, Mass., 1973-89. Office: Digital Equipment Corp 85 Swanson Rd Boxboro MA 01719

DEMMLER, JOHN HENRY, lawyer; b. Pitts., June 20, 1932; s. Ralph Henry and Catherine (Hollinger) D.; m. Janet Rice, July 20, 1957; children: Richard H., Ralph W., Carol L. BA, Princeton U., 1954; LLB cum laude, Harvard U., 1959. Bar: Pa. 1960, U.S. Dist. Ct. (we. dist.) Pa. 1960. Assoc. Reed Smith Shaw & McClay, Pitts., 1959-65, ptnr., 1966—; dir. Duquesne Light Co., Pitts. Trustee Shady Side Acad., Pitts., 1969-75, 77—, vice chmn. 1980-84, chmn., 1984-87. Mem. ABA (mem. bus. law sect. 1973—, pub. utility law sect. 1975—), Pa. Bar Assn. (mem. mcpl. law sect. 1972—, pub. utility law sect. 1976—), Duquesne Club, Fox Chapel Golf Club, Fox Chapel Racquet Club (Pitts.), Rolling Rock Club (Ligonier, Pa.), Nassau Club (Princeton, N.J.). Republican. Episcopalian. Home: 102 Foxtop Dr Pittsburgh PA 15238 Office: Reed Smith Shaw & McClay James H Reed Bldg 435 6th Ave Pittsburgh PA 15219

DEMMLER, RALPH HENRY, lawyer; b. Pitts., Aug. 22, 1904; s. Otto the Associate Deputy Administrator for Logistics at the Veterans Administration. Prior to this, she served in several other capacities at the Veterans Administration, including Associate Deputy Administrator for Management, 1985–1986, and Associate Deputy Administrator for Logistics, 1985. From 1981 to 1985, Ms. Livingstone served as the Executive Assistant to the Associate Deputy Director of the Veterans Administration for Logistics.

Ms. Livingstone graduated from the College of William and Mary (A.B., 1968), the University of Montana (M.A., 1972), and the Fletcher School of Law and Diplomacy (M.A., 1973). She was born January 13, 1946, in Carthage, MO. Ms. Livingstone is married and currently resides in Washington, DC.

Nomination of Abraham N.M. Shashy, Jr., To Be Assistant General Counsel of the Treasury

November 1, 1989

The President today announced his intention to nominate Abraham N.M. Shashy, Jr., to be Assistant General Counsel of the Treasury (Chief Counsel for the Internal Revenue Service). He would succeed William F. Nelson.

Since 1984 Mr. Shashy has served as a partner with the firm of Jones, Day, Reavis and Pogue in Dallas, TX. Prior to this, he was a partner with Kronish, Lieb, Shainswit, Weiner and Hellman in New York, 1981–1984, and an associate, 1976–1981. In addition, he served as an adjunct professor of taxation at Southern Methodist University School of Law, 1985–1986; adjunct professor of taxation at New York University School of Law, 1977–1984; instructor of taxation at New York University School of Law, 1975–1976; and instructor at the University of Florida College of Law, 1974.

Mr. Shashy graduated from the University of Florida (B.S., 1970), the University of Florida College of Law (J.D., 1973), and New York University School of Law (LL.M., 1975). He was born January 13, 1950, in Ocala, FL. Mr. Shashy is married, has two children, and resides in Dallas, TX.

Remarks at the Presentation Ceremony for the Malcolm Baldrige National Quality Awards

November 2, 1989

Thank you, Secretary Mosbacher, for the warm welcome. It's great to be back across the street, almost, at this wonderful Department. I first want to salute the Baldrige family—a special hello to Midge. Of course, I'm delighted to see the Secretary of the Treasury here and Ambassador Hills; able members of my Cabinet sitting next to them; Dr. Bromley, our Science Advisor, who has a keen interest in the success of the work of this Department.

I want to salute Deputy Secretary Murrin and Under Secretary Betti. And I think I spotted Strom—I know I did—over here. And it's a little hard to see, but Jesse Helms was to be here, Congressmen Sherry Boehlert, Don Ritter. George Brown, I do see, Howard Coble, Doug Walgren, and Nancy Johnson. And if I missed a few—Alec McMillan, I think. And I can't see who else we've got over there, but nevertheless, welcome to the Members of Congress, whose support is absolutely essential for the workings of the Commerce Department.

In just a few moments, it will be my pleasure to present awards named after a great public servant and a close and dear friend, Malcolm Baldrige. So, let me just say a few words about Mac. He had a zest for life—Nancy, I didn't see you—had a zest for life, love of family, and a love of country that was uncommon. He was an outstanding Secretary of Commerce for 6½ years, and he was also an outstanding friend. Mac's word of honor—as those of you who worked with him—was his bond, as good as a $20 gold piece.

And he never quite fit any mold. In this town, they always try to make you fit into some mold. Baldrige never quite fit the mold. He was the president of a very successful company who spent a lot of his time with volunteer firemen when his wife wasn't doing that kind of work. He was the son of the East who rode horses and loved his place in New Mexico. He felt at home with cowboys because he roped with them all of his life. You'd never have known it from his friendly, easygoing manner, but he was also a bit of a perfectionist, in word and deed.

As a leader in business, Mac strived for quality in products; as Commerce Secretary, for quality in public policies. Even the language—some of you may well remember, to your horror—the language of his memos was lean and exact. In fact, he had a special computer software program for Commerce Department documents, one that automatically weeded out jargon like impacted, viable, infrastructure. [*Laughter*] Sort of Gramm-Rudman cut of the English language, if you will. [*Laughter*]

But like all perfectionists, he knew that perfection is not reaching the attainable. Rather, it's a never-ending quest for the unattainable. His life was such a quest, a life whose legacy leaves us with a profound insight: A truly successful man or woman is someone who has, indeed, served others.

Companies, like people, are successful only to the extent to which they provide service. This is true for all business, from the humblest mom-and-pop operation to the largest corporation. The improvement of quality in products and the improvement of quality in service—these are national priorities as never before. In recent years, Americans have felt the sting of fierce competition on a global scale, and we've learned to see foreign competition not as an excuse to close doors and raise barriers but as an incentive to renew our own commitment to excellence.

American managers have reconsidered every time-honored belief, every traditional practice, every customary procedure; and they've embraced what works and rejected the past. They've studied examples of innovation from home and abroad and adopted only the best. And we now know the result of this historic reassessment: When it comes to meeting the competition, America is back in business.

We're here today to honor two companies that are leading this resurgence. They're leading the resurgence in American business leadership. Most companies catch hell from the competition, but these two companies are in the lead because no competitor gave them a tougher time than they gave themselves. Of course, in business, success is its own reward. And yet all American firms benefit by having a standard of excellence to match and perhaps, one day, to surpass. For 1989 there can be no higher standard of quality management than those provided by the winners of the Malcolm Baldrige National Quality Award: Milliken & Company and the Xerox Corporation.

Both of these manufacturing firms were well-established leaders in their markets, yet both were being steadily squeezed out by the intense foreign and domestic competition. In the midst of this crisis, the men and women of these companies found within themselves the will to make a painstaking reassessment and the drive to win back that market share. Both companies started down this path of reassessment with a simple premise: In business, there is only one definition of quality—the customer's definition. And then they proceeded from this one premise to restructure their production and marketing plan. Sounds simple. But I know, as a former tiny businessman myself, how difficult it is to restructure a firm from top to bottom. And today's winners know what is possible when a firm restructures itself from the bottom up. They know that a company can no longer afford to regard employees as automatons in a production line. They know that a company must rely on the intelligence, judgment, and good character of the people it employs.

And there are as many successful forms of management as there are successful companies. But for these two companies, success came when they developed their human as well as their technological potential. Milliken, for example, a 125-year-old textile manufacturer in South Carolina—but its management style is sheer 21st century. Milliken scrapped the old management hierarchy in favor of what they call a flat management structure—good thing they're not a tire company—[*laughter*]—flat management structure. Milliken even gave a new title to its employees, calling them associates. And this is no hollow accolade for public relations. Every Milliken employee, I'm told, truly is an associate. In fact, any Milliken worker has the power to halt that production line if he or she detects a problem in quality or safety.

Our other winner takes a similar approach with its "Team Xerox" philosophy. Xerox employees are given the authority that they have to have, that they need, to make day-to-day decisions. And they are, the company says, expected to take the initiative in finding and fixing problems—and they do. While every manager works, every worker is managing.

One of the best things about this award is that it allows successful companies to share what they have learned to set an example. Perhaps these two companies ought to merge—and be careful of the antitrust. [*Laughter*] Can you imagine it? Your wardrobes wouldn't just be coordinated; it would be collated. [*Laughter*]

Many firms will learn a great deal from their example. Others will need to follow their own path. But to those who say that we have lost our edge, that the days are past when "Made in America" meant the best, I say: Tell that to the people of the Milliken plant in Spartanburg, South Carolina. Tell that to the Xerox teams in upstate—up in Monroe County, New York.

Quality products and service is no accident. It's the result of a certain can-do, no-excuses attitude, an aggressive impatience with the status quo even in the best of times. And it's this attitude, more than anything else, that is responsible for the creation of wealth and jobs that we have seen over the last 7 years.

In these years, our total national wealth has grown by almost a third, and more than 20 million new jobs created. And we are still enjoying the rewards of what has proven to be the longest peacetime expansion in American history. So, given the right policies, and a reduced capital gains tax would be one—Congress, I hope you're listening—this expansion will continue. And given the right tools, the American people can reach even greater heights. The potential of this nation is as boundless as the imagination and drive of the American people. All we have to do for our citizens is what these two companies have done for their employees: give them the freedom to do what they do best—freedom to imagine, freedom to create, and freedom to excel. Our winners had such freedom, and they certainly made the most of it.

I give my heartiest congratulations to Roger Milliken, who is here, and to David Kearns. And I give my heartiest congratulations to your employees, your associates. And thank you all for being here to honor these two successful stories. Thank you very, very much.

Note: The President spoke at 10:34 a.m. in Malcolm Baldrige Hall at the Commerce Department. In his remarks, he referred to Secretary of Commerce Robert A. Mosbacher; Malcolm Baldrige's widow, Margaret (Midge); Secretary of the Treasury Nicholas F. Brady; U.S. Trade Representative Carla A. Hills; Deputy Secretary of Commerce Thomas J. Murrin; Under Secretary of Defense John A. Betti; Senators Strom Thurmond of South Carolina and Jesse Helms of North Carolina; Roger Milliken, chairman and chief executive officer of Milliken & Co.; and David T. Kearns, chairman and chief executive officer for business and products systems for Xerox Corp.

Work

HENRY DAVID THOREAU, *Walden*, chapter 18, p. 436 (1966). Originally published in 1854.

World

2033 Give me matter, and I will construct a world out of it!

IMMANUEL KANT, "Universal Natural History and Theory of the Heavens," Preface, *Kant's Cosmogony*, trans. W. Hastie, p. 29 (1900).

2034 The world is large, when its weary leagues two loving hearts divide;
But the world is small, when your enemy is loose on the other side.

JOHN BOYLE O'REILLY, "Distance," *Watchwords from John Boyle O'Reilly*, ed. Katherine E. Conway, p. 16 (1892).

These lines were quoted by Senator John F. Kennedy in a speech at the Al Smith Memorial Dinner in New York City, October 19, 1960, and, as president, to the Irish Parliament, Dublin, Ireland, June 28, 1963.

2035 We have it in our power to begin the world over again.

THOMAS PAINE, "Common Sense," conclusion, *The Complete Writings of Thomas Paine*, ed. Philip S. Foner, vol. 1, p. 45 (1945). Originally published in 1776.

President Ronald Reagan quoted these words in a televised presidential campaign debate with Walter F. Mondale, October 7, 1984.

2036 The world of the future will not flourish behind walls—no matter who builds them and no matter what their purpose. A world divided economically must inevitably be a world divided politically. As Secretary of State, I cannot contemplate that prospect with anything but deep disquiet.

WILLIAM P. ROGERS, secretary of state, address before the Chamber of Commerce of the United States, Washington, D.C., May 1, 1972.—*The Washington Post*, May 22, 1972, p. A20.

2037 Physicists and astronomers see their own implications in the world being round, but to me it means that only one-third of the world is asleep at any given time and the other two-thirds is up to something.

DEAN RUSK, secretary of state, speech to the American Bar Association, Atlanta, Georgia, October 22, 1964, as reported by *The Atlanta Constitution*, October 23, 1964, p. 10.

2038 For I dipt into the future, far as human eye could see,
Saw the Vision of the world, and all the wonder that would be;

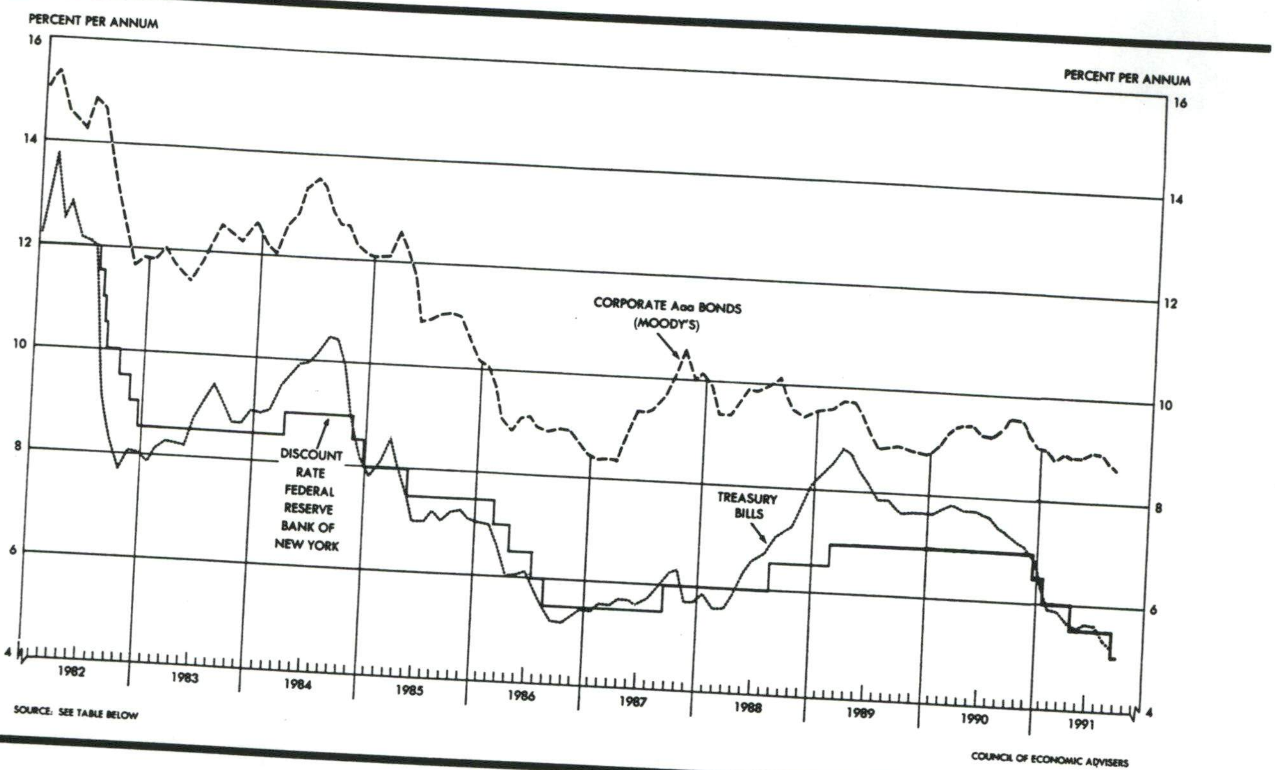
Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down with costly bales;

Heard the heavens fill with shouting, and there rain'd a ghastly dew
From the nations' airy navies grappling in the central blue;

Far along the world-wide whisper of the south-wind rushing warm,
With the standards of the peoples plunging thro' the thunder-storm;

INTEREST RATES AND BOND YIELDS

Interest rates fell in September.



[Percent per annum]

Period	U.S. Treasury security yields			High-grade municipal bonds (Standard & Poor's) [3]	Corporate Aaa bonds (Moody's)	Prime commercial paper, 6 months [1]	Discount rate (N.Y. F.R. Bank) [4]	Prime rate charged by banks [4]	New-home mortgage yields (FHFB) [5]
	3-month bills (new issues) [1]	Constant maturities [2]							
		3-year	10-year						
1981	14.029	14.44	13.91	11.23	14.17	14.76	13.42	18.87	14.70
1982	10.686	12.92	13.00	11.57	13.79	11.89	11.02	14.86	15.14
1983	8.63	10.45	11.10	9.47	12.04	8.89	8.50	10.79	12.57
1984	9.58	11.89	12.44	10.15	12.71	10.16	8.80	12.04	12.38
1985	7.48	9.64	10.62	9.18	11.37	8.01	7.69	9.93	11.55
1986	5.98	7.06	7.68	7.38	9.02	6.39	6.33	8.33	10.17
1987	5.82	7.68	8.39	7.73	9.38	6.85	5.66	8.21	9.31
1988	6.69	8.26	8.85	7.76	9.71	7.68	6.20	9.32	9.19
1989	8.12	8.55	8.49	7.24	9.26	8.80	6.93	10.87	10.13
1990	7.51	8.26	8.55	7.25	9.32	7.95	6.98	10.01	10.05
1990: Sept	7.38	8.27	8.89	7.40	9.56	7.83	7.00–7.00	10.00–10.00	9.90
Oct	7.19	8.07	8.72	7.40	9.53	7.81	7.00–7.00	10.00–10.00	9.98
Nov	7.07	7.74	8.39	7.10	9.30	7.74	7.00–7.00	10.00–10.00	9.90
Dec	6.81	7.47	8.08	7.04	9.05	7.49	7.00–6.50	10.00–10.00	9.76
1991: Jan	6.30	7.38	8.09	7.05	9.04	7.02	6.50–6.50	10.00–9.50	9.65
Feb	5.95	7.08	7.85	6.90	8.83	6.41	6.00–6.00	9.50–9.00	9.57
Mar	5.91	7.35	8.11	7.07	8.93	6.36	6.00–6.00	9.00–9.00	9.43
Apr	5.67	7.23	8.04	7.05	8.86	6.07	6.00–5.50	9.00–9.00	9.60
May	5.51	7.12	8.07	6.95	8.86	5.94	5.50–5.50	8.50–8.50	9.52
June	5.60	7.39	8.28	7.09	9.01	6.16	5.50–5.50	8.50–8.50	9.46
July	5.58	7.38	8.27	7.03	9.00	6.14	5.50–5.50	8.50–8.50	9.43
Aug	5.39	6.80	7.90	6.89	r 8.75	5.76	5.50–5.50	8.50–8.50	9.48
Sept p	5.25	6.50	7.65	6.80	8.61	5.59	5.50–5.00	8.50–8.00	....
Week ended:									
1991: Aug 31	5.40	6.70	7.84	6.85	8.70	r 5.76	5.50–5.50	8.50–8.50	....
Sept 7	5.34	6.66	7.80	6.86	8.67	5.74	5.50–5.50	8.50–8.50	....
14	5.29	6.56	7.71	6.86	8.63	5.58	5.50–5.00	8.50–8.00	....
21	5.19	6.48	7.61	6.77	8.60	5.53	5.00–5.00	8.00–8.00	....
28	5.18	6.38	7.55	6.71	8.56	5.55	5.00–5.00	8.00–8.00	....

[1] Bank-discount basis.
[2] Yields on the more actively traded issues adjusted to constant maturities by the Treasury Department.
[3] Weekly data are Wednesday figures.
[4] Average effective rate for year; opening and closing rate for month and week.
[5] Effective rate (in the primary market) on conventional mortgages, reflecting fees and charges as well as contract rate and assumed, on the average, repayment at end of 10 years.

Sources: Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Housing Finance Board, Moody's Investors Service, and Standard & Poor's Corporation.

marlow industries, inc.®

Thermoelectric Products

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10451 Vista Park Road
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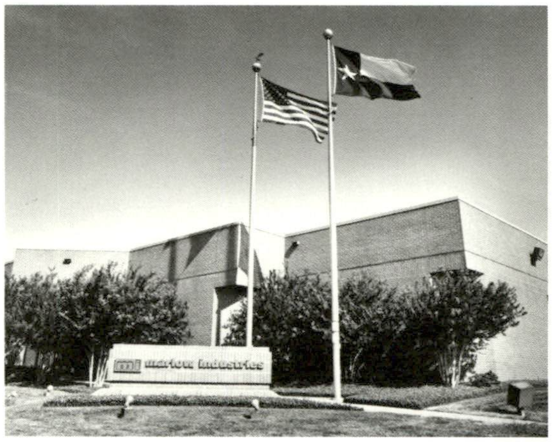
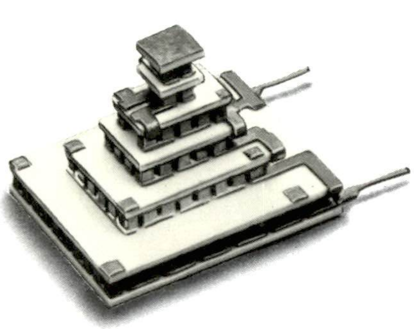


Marlow Industries, Inc.,'s corporate offices located in Dallas, Texas.

Marlow Industries was incorporated in 1973 exclusively for the technical advancement and manufacturing of thermoelectric coolers (TECs) and related assemblies. Since then, we have opened a branch office and technical center in England to support the growing demand in Europe. Today, we have established a reputation as a "world class" leader in the thermoelectric industry unrivaled in using the latest technology to produce high quality products.



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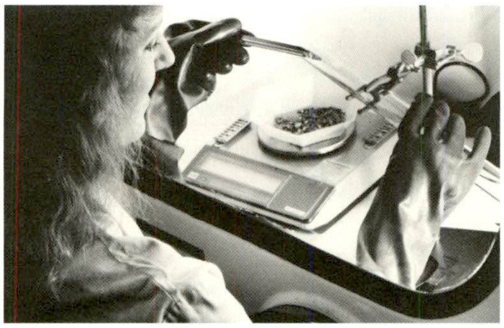
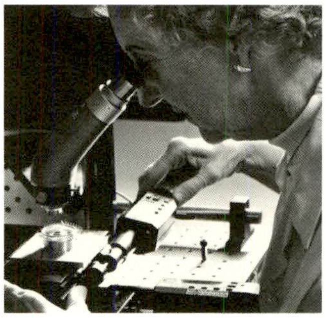
214 340-4900

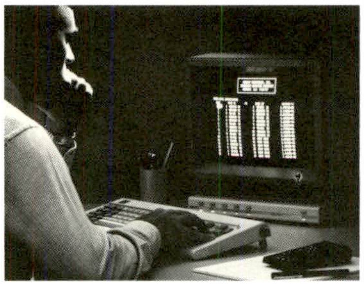
Capabilities



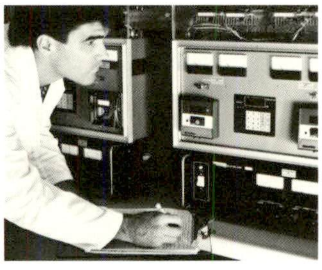
TE material is prepared in a controlled environment.



Every TEC shipped by Marlow Industries is passed through Statistical Process Control operations.



Special computer software, developed in-house, aids in custom designing and modeling TECs to exact customer specifications.



Sophisticated burn-in equipment ensures TEC reliability for a variety of customer requirements.

Marlow Industries demonstrates its commitment to quality by maintaining in-house control of the entire production process. Thermoelectric material is grown in our own laboratory, piece parts are processed, assembled, and final tested, all in-house. As a vertically integrated manufacturer, we can supply any thermo-electric need.

Total Quality Control

Marlow Industries' **Total Quality Control Program** is based on the concepts of Statistical Process Control, with an in-process inspection system which includes 100% performance testing. This system is designed to ensure that Marlow Industries meets or exceeds all customer requirements.

Standard Products and Custom Design

Our personnel are highly trained with years of experience in designing thermoelectric coolers for many unique applications. Marlow Industries offers TECs designed to meet requirements for shape, size, operation at various temperatures, voltage-current relationships, fast transient response, and high shock environments to name a few. In addition to our extensive Standard Product line, we offer custom design services to meet special requirements.

Special Processing and Testing

Special TECs can be optimized with high performance thermoelectric materials for specific operating temperatures, increased reliability for space applications, and added strength for High-G environments. A special ***telecom grade*** screening process is also available which includes burn-in and rigorous cleaning to minimize contamination in a hermetic package for extended life.

Accessories and Related Products

Whether custom designed or selected from stock, our TECs are supported by a full line of accessories and related products to facilitate incorporating TECs into a variety of applications.

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Typical Applications

Thermoelectric coolers are ideally suited to a wide variety of applications due to their small size, wide operating temperature range, low power requirements, and high reliability. Applications can be found in military, aerospace, and commercial products, laboratory and scientific equipment, medical instruments, and test equipment. Following is a representative list of where TECs are now being used.

Electro-optics

Electro-optics applications include stabilizing the temperature of solid-state lasers, and cooling infrared detectors and charge-coupled devices *(CCDs)* in the following:

Space Telescope Cameras
Self-Scanned Array Systems
Laser Gyros for Navigation
Lightwave Transmitters
Medical Laser Equipment
Thermal Viewers
Infrared Seeking Missiles
High Resolution CCD Cameras
Thermal Weapon Sights
Black Body References

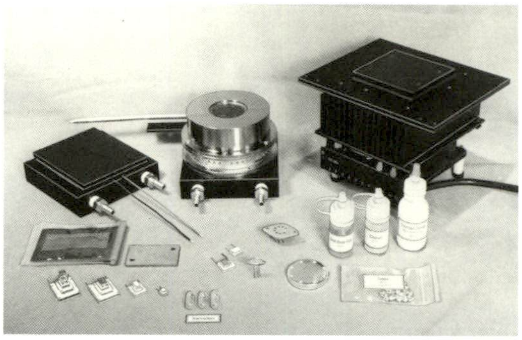
Volume Cooling

Volume cooling includes small volumes of air or liquid, and cold plates in the following applications:

Small Forced-Air Cooling Systems
Dehumidifiers
NASA Life Science Environmental Chambers
Missile Inertial Guidance Systems
Hotel Room Refrigerators
Mobile Home and Recreational Vehicle Refrigerators
Electronic Enclosures
Constant Temperature Baths
Dewpoint Hydrometers
Blood Analyzers
Wafer Thermal Characterization

Miscellaneous Electronic Components

High Speed Integrated Circuits
Parametric Amplifiers
Avalanche Photo Diodes
Vidicon Tubes



Marlow Industries' TECs are supported by a full line of accessories and services.

Advantages of Using Thermoelectric Cooling

Localized Cooling
Solid State Reliability
Temperature Control Above or Below Ambient
DC Powered
No Gases or Refrigerant Required
Small, Lightweight Package
Operation in Any Orientation
High Resistance to Shock and Vibration
Operation in Zero Gravity
No Moving Parts
Operation in High-G Levels
No Acoustical Noise
Heating or Cooling--Depending on Current Direction
No Electrical Noise
Precision Temperature Control to less than .05°C
Maintenance Free

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Theory of Thermoelectrics

What is a Thermoelectric Cooler?

Thermoelectric coolers *(TECs)* are small heat pumps which obey the laws of thermodynamics as do conventional mechanical heat pumps *(refrigerators)*, absorption refrigerators, and other devices involving the transfer of heat energy, with the exception that TECs are solid state devices.

Single-Stage Thermoelectric Coolers

A single-stage thermoelectric cooler is composed of a matrix of thermoelectric couples, connected electrically in series and thermally in parallel. The thermoelectric couple (as shown in Figure 1) consists of a p- and n-type semiconductor material, rather than dissimilar metals as used by Peltier, because of the semiconductor's higher performance.

A TEC can be fabricated with as few as one couple to as many as several hundred couples sandwiched between two ceramic plates. These plates form the top and base of the cooler and provide structural integrity as well as electrical insulation from, and thermal conduction to, the heat sink and the device being cooled.

How it Works

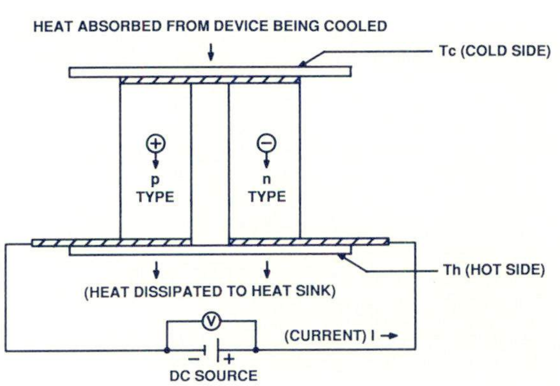
Regulating the direction and amount of current--with the use of a feedback loop and temperature controller--allows TECs to cool, heat, or stabilize temperature. Reversing the direction of the current reverses the direction of heat pumping. Figure 1 illustrates the operation of a thermoelectric couple in the cooling mode.

When a positive DC voltage is applied to the n-type thermoelement, electrons pass from the p- to the n-type thermoelement and the cold side temperature *(Tc)* will decrease as heat is absorbed.

The heat absorption *(cooling)* is proportional to the current and the number of thermoelectric couples, and occurs when electrons pass from a low energy level in the p-type thermoelement, to a higher energy level in the n-type thermoelement. The heat is then conducted through the thermoelement to the hot side *(Th)*, and liberated as the electrons return to a lower energy level in the p-type thermoelement.

It is necessary to remove the heat dissipated at the hot side of the TEC and pass it on to the environment using a heat sink. The amount of heat dissipated at the hot side consists of the heat pumped from the cold side plus the input power to the TEC. It is not practical to achieve a successful thermoeletric cooling system without an effective

Figure 1
Peltier Thermoelectric Couple



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heat sink to efficiently dissipate this energy.

Although the Peltier cooling is proportional to the current applied to the TEC, the power dissipated by Joule heating in the TEC is proportional to the square of the current, and it can be shown that half of this Joule heat must be pumped from the cold junction. For this reason, an increase in current above a certain value will result in *less* net cooling because the Joule heating is increasing at a faster rate than the Peltier cooling. The value of current which yields the greatest cooling is referred to as "Imax."

Performance Characteristics

TECs are typically rated by their "Maximum" values obtained at Imax with a hot side temperature fixed at 27°C. Four performance parameters are typically used when discussing a TEC's performance:

Imax: TEC current which yields the greatest net cooling.

ΔTmax: Temperature difference across the TEC at Imax with no applied heat load.

Qmax: The amount of applied heat load necessary to suppress the temperature difference across the TEC to zero at Imax.

Vmax: TEC voltage at Imax with no applied heat load.

Because the properties of the thermoelectric material are temperature dependent, the TEC's performance is also temperature dependent and, in general, improves with increasing temperature. As with any heat pump, the efficiency of a TEC increases as the temperature difference across it decreases.

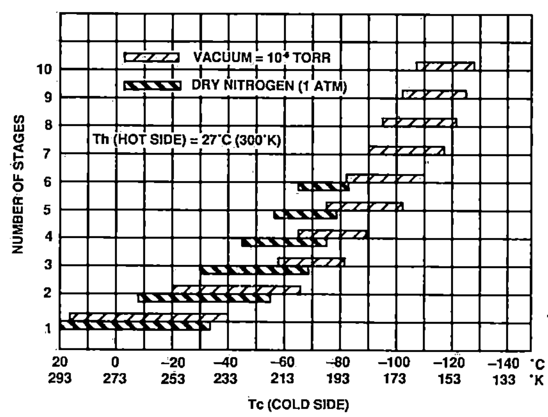
Multi-Stage Thermoelectric Coolers

A multi-stage TEC is essentially two or more single-stage TECs, stacked vertically with fewer thermocouples in each ascending stage. A multi-stage TEC is therefore typically pyramid-shaped, because the lower stage requires more thermoelectric couples to pump the heat dissipated by the upper stages, in addition to the heat pumped from the cold side.

The applied heat load generally determines the lowest cold side temperature that a TEC will obtain. However, even with zero heat load, regardless of the amount of power applied, every TEC has a theoretical maximum temperature differential which is designated as its ΔTmax.

This ΔTmax is determined by the number of stages and the properties of the thermoelectric material. No-load temperature differentials range from 67°C for single-stage TECs to over 135°C for multi-stage TECs *(see Figure 2)*. TECs are available with heat pumping capacities ranging from several tenths of a watt to over 50 watts. Using several TECs thermally in parallel, it is possible to achieve larger cooling capacities.

Figure 2
Cold Side Temperature vs. Number of Stages



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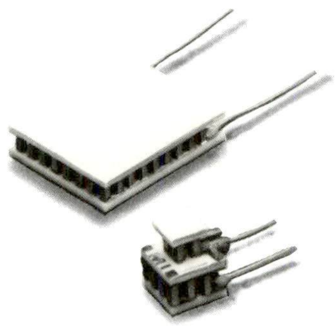
TEC Selection Considerations



Before beginning the TEC selection process, the cooling requirements must be defined. This includes determining the amount of heat to be pumped, the TEC hot side temperature, and the required cold side temperature of the TEC.

Heat Load

The following discussion applies only to steady state heat loads. If the heat load is of a transient nature or involves more complex factors such as air or fluid flow, we suggest you call one of our applications engineers for assistance.

The heat load consists of two major components; active and passive.

Active--Power dissipated by the device being cooled is considered an "active" load and is equal to the input power to that device.

Passive--This is a parasitic heat load which may consist of three components: radiation, convection, and conduction.

Radiation: The radiation loading on a system is proportional to the product of the exposed cold area and the difference of the fourth power of the absolute ambient and load temperatures. Radiation loading is usually significant in systems with small active loads and large temperature differences.

Convection: The convective loading on a system is a function of the exposed cold area and the difference in temperature between this area and the ambient environment. Convective loading is usually most significant in systems with small active loads or large temperature differences.

Conduction: The conductive loading on a system occurs through mounting screws, lead wires, etc., which form a thermal path from the device being cooled to the heat sink or ambient environment.

Our technical paper entitled "Estimating Heat Loads for Thermoelectric Coolers" may be referred to for further information on calculating these heat loads.

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Determining the TEC Hot Side Temperature

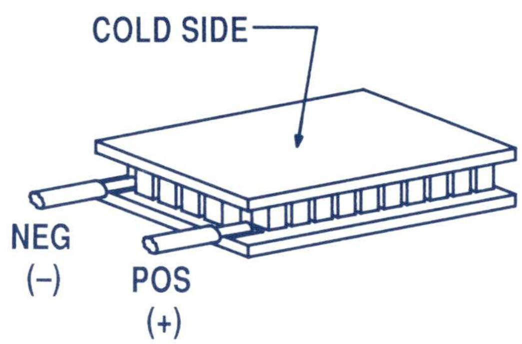
The use of a heat sink on the hot side of the TEC is mandatory to prevent the TEC from overheating. The heat sink is used to dissipate the heat pumped by the TEC, in addition to the heat dissipated internally by the TEC, to the surroundings *(which may be air or liquid)*. To do this, the heat sink will be warmer than the surroundings.

The thermal resistance *(efficiency)* of a heat sink is measured as the temperature rise of the hot side above ambient per watt of power dissipated into the heat sink. Therefore, the TEC hot side temperature may be estimated by multiplying the thermal resistance of the heat sink by the amount of heat dissipated at the hot side of the TEC. This is an iterative process because the amount of heat dissipated by the TEC at this stage of the design is normally not yet known.

The hot side temperature is also significant because it affects the "Maximum" performance values of the TEC. The values in the table on pages 8 and 9 are based on a hot side temperature of 27°C. These values may be used with less than 10% errors for hot side temperatures between 15° and 40°C.

Three types of heat sinks are usually used: 1) natural convection, 2) forced convection, and 3) liquid cooling. The choice depends on the requirements and constraints of each application. Typical performance values of 2.0° to 0.5°C/watt can be expected for natural convection, 0.5° to .02°C/watt for forced convection, and .02° to .005°C/watt for liquid cooling. Limiting the rise of the TEC hot side temperature to 5° to 15°C above the surroundings is usually practical.

Standard thermoelectric cooler configuration.



For maximum reliability, it is recommended that the hot side temperature of standard TECs be kept below 85°C, however, short-term exposure to as high as 120°C is acceptable for soldering the TEC to heat sinks.

Determining the TEC Cold Side Temperature

The temperature required at the cold side of the TEC should take into account the temperature difference between the TEC and the device being cooled. For applications where the device being cooled is in direct contact with the TEC *(such as infrared detectors, CCDs, laser diodes or integrated circuits)*, this temperature difference is typically very small and may be ignored in most cases. However, when cooling air or a liquid, the temperature difference across the heat exchanger, which is dependent on the efficiency of the heat exchanger, may be significant and must be taken into account.

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Standard Thermoelectric Coolers

(Ranked within each section below by increasing heat pumping capacity [Qmax].)

1-Stage TECs

TEC Model Number †	ΔTmax (°C) vacuum	ΔTmax (°C) dry N_2	Qmax (watts)	Imax (amps)	Vmax (volts)	Base Ceramic Width in. (mm)	Base Ceramic Length in. (mm)	Top Ceramic Width in. (mm)	Top Ceramic Length in. (mm)	Cooler Ht. in. (mm)	Ht. Tolerance ± in. (± mm)
SP1652†† (AC)	67	61	0.30	1.0	0.4	0.160 (4.1)	0.160 (4.1)	0.080 (2.0)	0.160 (4.1)	0.098 (2.5)	0.005 (0.1)
MI1010T†† (AC)	67	61	0.47	1.0	0.8	0.156 (4.0)	0.156 (4.0)	0.156 (4.0)	0.156 (4.0)	0.095 (2.4)	0.005 (0.1)
SP1594†† (AC)	67	61	0.80	0.9	1.3	0.160 (4.1)	0.280 (7.1)	0.160 (4.1)	0.240 (6.1)	0.085 (2.2)	0.005 (0.1)
MI1020T†† (AC)	67	64	0.90	1.8	0.8	0.156 (4.0)	0.156 (4.0)	0.156 (4.0)	0.156 (4.0)	0.085 (2.2)	0.005 (0.1)
SP1595†† (AC)	67	62	1.0	1.2	1.3	0.160 (4.1)	0.280 (7.1)	0.160 (4.1)	0.240 (6.1)	0.085 (2.2)	0.005 (0.1)
MI1011T†† (AC)	67	61	1.0	1.0	2.0	0.260 (6.6)	0.260 (6.6)	0.260 (6.6)	0.260 (6.6)	0.095 (2.4)	0.005 (0.1)
SP1590†† (AC)	67	61	1.2	0.9	1.9	0.235 (6.0)	0.285 (7.2)	0.235 (6.0)	0.245 (6.2)	0.085 (2.2)	0.005 (0.1)
SP1596†† (AC)	67	63	1.3	1.5	1.3	0.160 (4.1)	0.280 (7.1)	0.160 (4.1)	0.240 (6.1)	0.085 (2.2)	0.005 (0.1)
SP1591†† (AC)	67	62	1.6	1.2	2.0	0.235 (6.0)	0.285 (7.2)	0.235 (6.0)	0.245 (6.2)	0.085 (2.2)	0.005 (0.1)
SP1597†† (AC)	67	64	1.6	1.8	1.3	0.160 (4.1)	0.280 (7.1)	0.160 (4.1)	0.240 (6.1)	0.085 (2.2)	0.005 (0.1)
SP1592†† (AC)	67	63	2.0	1.5	2.0	0.235 (6.0)	0.285 (7.2)	0.235 (6.0)	0.245 (6.2)	0.085 (2.2)	0.005 (0.1)
MI1012T†† (AC)	67	61	2.1	1.0	3.7	0.346 (8.8)	0.346 (8.8)	0.346 (8.8)	0.346 (8.8)	0.095 (2.4)	0.005 (0.1)
SP1546T†† (AC)	66	57	2.2	1.8	1.9	0.188 (4.8)	0.872 (22.2)	0.188 (4.8)	0.872 (22.2)	0.095 (2.4)	0.005 (0.1)
SP1547T†† (AC)	65	54	2.2	1.8	1.9	0.248 (6.3)	0.872 (22.2)	0.248 (6.3)	0.872 (22.2)	0.095 (2.4)	0.005 (0.1)
MI1021T†† (AC)	67	64	2.2	1.8	1.9	0.260 (6.6)	0.260 (6.6)	0.260 (6.6)	0.260 (6.6)	0.085 (2.2)	0.005 (0.1)
SP1593†† (AC)	67	64	2.3	1.8	2.0	0.235 (6.0)	0.285 (7.2)	0.235 (6.0)	0.245 (6.2)	0.085 (2.2)	0.005 (0.1)
MI1015T†† (AC)	67	61	2.6	1.0	4.6	0.346 (8.8)	0.432 (11.0)	0.346 (8.8)	0.432 (11.0)	0.094 (2.4)	0.005 (0.1)
MI1060T†† (AC)	67	64	2.6	5.3	0.8	0.380 (9.7)	0.380 (9.7)	0.380 (9.7)	0.380 (9.7)	0.140 (3.6)	0.005 (0.1)
SP1614†† (AC)	67	62	4.0	0.9	6.5	0.161 (4.1)	1.167 (29.6)	0.161 (4.1)	1.097 (27.9)	0.125 (3.2)	0.005 (0.1)
SP1243*†† (AC)	67	64	4.0	1.8	3.5	0.346 (8.8)	0.389 (9.9)	0.346 (8.8)	0.389 (9.9)	0.095 (2.4)	0.005 (0.1)
MI1022T†† (AC)	67	64	4.0	1.8	3.5	0.346 (8.8)	0.346 (8.8)	0.346 (8.8)	0.346 (8.8)	0.085 (2.2)	0.005 (0.1)
MI1013T†† (AC)	67	61	4.8	1.0	8.5	0.518 (13.2)	0.518 (13.2)	0.518 (13.2)	0.518 (13.2)	0.095 (2.4)	0.005 (0.1)
MI1025T†† (AC)	67	64	5.0	1.8	4.4	0.346 (8.8)	0.432 (11.0)	0.346 (8.8)	0.432 (11.0)	0.084 (2.1)	0.005 (0.1)
SP1507*†† (AC)	67	64	5.4	1.8	4.7	0.564 (14.3)	0.444 (11.3)	0.444 (11.3)	0.444 (11.3)	0.096 (2.4)	0.008 (0.2)
MI1061T (AC)	67	64	6.4	5.3	1.9	0.511 (13.0)	0.590 (15.0)	0.511 (13.0)	0.511 (13.0)	0.140 (3.6)	0.005 (0.1)
MI1023T**†† (AC)	67	64	9.2	1.8	8.0	0.518 (13.2)	0.518 (13.2)	0.518 (13.2)	0.518 (13.2)	0.085 (2.2)	0.005 (0.1)
MI1064T** (AC)	67	64	13.0	5.3	4.0	0.770 (19.6)	0.923 (23.4)	0.770 (19.6)	0.770 (19.6)	0.140 (3.6)	0.005 (0.1)

† Ceramic material is indicated below model number: AC = aluminum oxide ceramics, BC = beryllium oxide ceramics, AB = a combination of aluminum oxide & beryllium oxide ceramics.
††Available with elevated temperature burn-in. ††† Elevated temperature burn-in is included in price; TEC is shipped soldered to a test stand.
**Specially designed with a center hole; contact Customer Service for inside dimensions. **Available lapped to ±.001 in. (.025); nominal height will change on lapped models.*

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Standard Thermoelectric Coolers

(Ranked within each section below by increasing heat pumping capacity [Qmax].)

	TEC Model Number †	ΔTmax (°C) vacuum	ΔTmax (°C) dry N_2	Qmax (watts)	Imax (amps)	Vmax (volts)	Base Ceramic Width in. (mm)	Base Ceramic Length in. (mm)	Top Ceramic Width in. (mm)	Top Ceramic Length in. (mm)	Cooler Ht. in. (mm)	Ht. Tolerance ± in. (± mm)
	MI1092** (AC)	67	64	20.0	9.0	3.5	1.160 (29.5)	1.160 (29.5)	1.160 (29.5)	1.160 (29.5)	0.212 (5.4)	0.010 (0.3)
	MI1120** (AC)	67	64	25.0	11.2	3.5	1.167 (29.6)	1.167 (29.6)	1.167 (29.6)	1.167 (29.6)	0.195 (4.9)	0.010 (0.3)
	MI1063T** (AC)	67	64	27.0	5.3	8.1	1.170 (29.7)	1.320 (33.5)	1.170 (29.7)	1.170 (29.7)	0.140 (3.6)	0.005 (0.1)
	MI1142** (AC)	67	64	31.0	14.0	3.4	1.170 (29.7)	1.170 (29.7)	1.170 (29.7)	1.170 (29.7)	0.177 (4.5)	0.010 (0.3)
	MI1049T (AC)	67	64	38.0	4.2	14.4	1.170 (29.7)	1.320 (33.5)	1.170 (29.7)	1.170 (29.7)	0.125 (3.2)	0.005 (0.1)
	MI1069T** (AC)	67	64	48.0	5.3	14.4	1.500 (38.1)	1.650 (41.9)	1.500 (38.1)	1.500 (38.1)	0.140 (3.6)	0.005 (0.1)
2-Stage TECs	MI2022T (AC)	89	78	0.39	1.4	0.8	0.154 (3.9)	0.154 (3.9)	0.125 (3.2)	0.125 (3.2)	0.149 (3.8)	0.007 (0.2)
	MI2011T (AC)	90	76	0.47	0.7	1.9	0.260 (6.6)	0.260 (6.6)	0.156 (4.0)	0.156 (4.0)	0.168 (4.3)	0.015 (0.4)
	MI2021T (AC)	91	83	0.92	1.4	2.0	0.260 (6.6)	0.260 (6.6)	0.156 (4.0)	0.156 (4.0)	0.149 (3.8)	0.007 (0.2)
	MI2060 (AC)	96	83	1.1	5.5	0.8	0.380 (9.7)	0.380 (9.7)	0.205 (5.2)	0.205 (5.2)	0.294 (7.5)	0.013 (0.3)
	SP1548 (AC)	89	71	1.9	1.4	4.4	0.960 (24.4)	0.250 (6.4)	0.968 (24.6)	0.187 (4.8)	0.165 (4.2)	0.007 (0.2)
	MI2012T (AC)	86	77	2.4	1.2	5.4	0.432 (11.0)	0.389 (9.9)	0.346 (8.8)	0.260 (6.6)	0.147 (3.7)	0.007 (0.2)
	SP1412 (AC)	84	78	3.1	1.9	3.9	0.188 (4.8)	0.864 (22.0)	0.208 (5.3)	0.520 (13.2)	0.172 (4.4)	0.007 (0.2)
	MI2064 (AB)	99	92	9.6	5.6	8.2	1.167 (29.6)	1.167 (29.6)	0.511 (13.0)	0.511 (13.0)	0.293 (7.4)	0.015 (0.4)
	MI2063 (AB)	91	83	14.0	5.0	8.4	1.167 (29.6)	1.167 (29.6)	0.770 (19.6)	0.770 (19.6)	0.293 (7.4)	0.015 (0.4)
3-Stage TECs	MI3021T (AC)	110	96	0.33	1.3	1.9	0.260 (6.6)	0.260 (6.6)	0.100 (2.5)	0.100 (2.5)	0.212 (5.4)	0.010 (0.3)
	MI3026T (AC)	109	93	0.62	1.3	3.4	0.346 (8.8)	0.346 (8.8)	0.160 (4.1)	0.174 (4.4)	0.234 (5.9)	0.010 (0.3)
	SP1056 (BC)	105	78	5.6	4.5	7.3	0.855 (21.7)	1.113 (28.3)	0.320 (8.1)	1.250 (31.8)	0.572(14.5)	0.020 (0.5)
	MI3040 (BC)	109	98	5.6	4.5	7.3	0.855 (21.7)	1.113 (28.3)	0.339 (8.6)	0.511 (13.0)	0.430(10.9)	0.015 (0.4)
4-Stage TECs	MI4010T††† (BC)	117	---	0.17	1.2	1.9	0.260 (6.6)	0.260 (6.6)	0.100 (2.5)	0.100 (2.5)	0.311 (7.9)	0.015 (0.4)
	MI4000T††† (BC)	110	---	0.43	0.6	7.0	0.520 (13.2)	0.678 (17.2)	0.160 (4.1)	0.314 (8.0)	0.345 (8.8)	0.013 (0.3)
	MI4012T††† (BC)	114	---	0.76	1.0	6.7	0.520 (13.2)	0.678 (17.2)	0.160 (4.1)	0.314 (8.0)	0.345 (8.8)	0.013 (0.3)
	MI4040††† (BC)	120	---	2.7	4.0	6.8	0.855 (21.7)	1.113 (28.2)	0.253 (6.4)	0.425 (10.8)	0.561(14.3	0.020 (0.5)
6-Stage TECs	MI6010T††† (BC)	122	---	0.31	0.7	5.8	0.432 (11.0)	0.518 (13.2)	0.088 (2.2)	0.131 (3.3)	0.441(11.2)	0.020 (0.5)
	MI6020††† (BC)	122	---	0.28	1.8	6.4	0.855 (21.7)	1.113 (28.3)	0.205 (5.2)	0.205 (5.2)	0.842(21.4)	0.020 (0.5)
	MI6030††† (BC)	133	---	0.58	3.6	6.3	0.855 (21.7)	1.113 (28.3)	0.205 (5.2)	0.205 (5.2)	0.809(20.5)	0.020 (0.5)

† Ceramic material is indicated below model number: AC = aluminum oxide ceramics, BC = beryllium oxide ceramics, AB = a combination of aluminum oxide & beryllium oxide ceramics.
†† Available with elevated temperature burn-in. ††† Elevated temperature burn-in is included in price; TEC is shipped soldered to a test stand.
** Specially designed with a center hole; contact Customer Service for inside dimensions. ** Available lapped to ±.001 in. (.025); nominal height will change on lapped models.*

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Dallas, Texas 75238-1645
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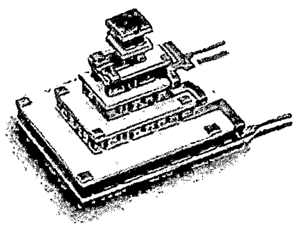
Thermoelectric Coolers



Model Number Specification

For complete product specifications, please ask our Customer Service Department for product data sheets on the TECs which will best meet your needs. The complete model number consists of the base model number followed by the type of metallization and type of ceramic. (See installation recommendations at right regarding metallization.)

–01 means both sides are metallized

–02 means hot side only is metallized

–03 means no metallization

- AC means aluminum oxide ceramics
- BC means beryllium oxide ceramics
- AB means a combination of AC and BC ceramics.

For example, an MI1021T with both sides metallized is specified as: MI1021T–01AC followed by any special options from the list below.

Special options available include:

- Pretinning with 96°C or 117°C solder on metallized ceramic surface(s).
- Thermistor mounted on edge of cold-side ceramic. (Calibration available.)
- Lapped to ±.001 inch (.025 mm) of a nominal height. (Available on some TECs. See table of "Standard Thermoelectric Coolers," pp. 8-9.)
- Elevated temperature burn-in. (Standard on some TECs, available on others. See table of "Standard Thermoelectric Coolers," pp. 8-9.)

Installation

Thermoelectric coolers are mounted using one of three methods: bonding with thermal epoxy, compression with thermal compound (MI Blue Goo®), or soldering to metallized ceramic(s). See "Assemblies & Related Products," p. 11, for our full-range of mounting kits.

When bonding or soldering methods are used, care must be taken to ensure that thermal stresses (due to the mismatch in expansion coefficients between the TEC and the material to which the TEC is being bonded) are minimized to prevent damage to the TEC.

For most applications, TECs with ceramic dimensions less than 3/4 inch (19.1 mm) on all sides can be soldered or bonded without concern of failure due to thermal stresses. A thin layer of copper metallization on the hot- and/or cold-side ceramic permits soldering without affecting performance or interfering with other methods of mounting. The compression method is recommended for most applications when the TEC ceramics are longer than 3/4 inch (19.1 mm) on any side.

Operation Recommendations

For maximum reliability, storage and operation below 85°C in a non-condensing environment is recommended.

To minimize thermal stresses, use linear/proportional temperature control or a similar method rather than an ON/OFF method. See "Temperature Controller/Power Supplies," p. 12.

Never abrade or machine beryllium oxide (BC) ceramics without following appropriate safety procedures. A Material Safety Data Sheet is available upon request.

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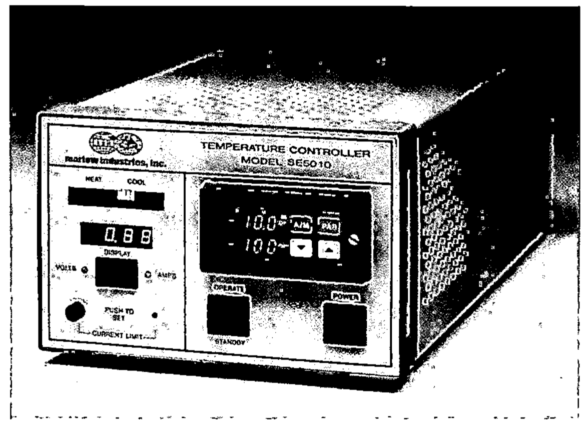
214 340-4900

Assemblies & Related Products

Description	Model No.	General Information (Dimensions are in inches followed by mm)
Cold Plates		
Liquid-Cooled	ST2018	ΔTmax=49°C; Vmax=12.4 volts; Imax=9.5 amps; Qmax=70 watts; 3.5 x 4.25 (89 x 109) cold plate
Fan-Cooled	ST2033	ΔTmax=38°C; Vmax=12.5 volts; Imax=8.5 amps; Qmax=60 watts; 3.25 x 3.25 (83 x 83) cold plate
Vacuum Enclosure	ST1018	3.6 (91) ID; 1.5 (38) dia. Quartz window; O-Ring seal; 42 electrical feed-throughs
Heat Sinks		
Fan-Cooled	ST2032	Fan power required: 115 VAC, 60Hz; Heat sink resistance=0.15°C/ watt
Liquid-Cooled	ST1050	Water supply required; Heat sink resistance=0.05°C/watt @ 0.4 gal/min.
Headers (Soldering of TECs to Headers is available.)		
TO-3	2408-01	8 pins, gold plated
TO-37	2275-01	6 pins, gold plated
Round-Plate	2376-01	1.63 dia. x 0.25 thick (41 x 6) nickel-plated with 4, 6, or 8 insulated terminals,
Flat-Plate	1932-02	2.12" x 1.38" x 0.12" (54 x 35 x 3) nickel-plated with 2 mounting holes
Mounting Kits		
Soldering Kit		Contains acid-based fluxes, module cleaner, solder, permanent epoxy, and, for compression thermal interfaces, non-hardening thermal compound (MI Blue Goo®)
	052-0001	Small kit with 96°C solder (1 to 25 modules)
	052-0002	Large kit with 96°C solder (26 to 100 modules)
	052-0007	Small kit with 117°C solder (1 to 25 modules)
	052-0008	Large kit with 117°C solder (26 to 100 modules)
Epoxy Kit		Contains permanent epoxy, used for permanent thermal interface, and, for compression thermal interfaces, non-hardening thermal compound (MI Blue Goo®).
	052-0003	Small kit (1 to 25 Modules)
	052-0004	Large kit (26 to 100 Modules)
Thermal Compound Kit		Contains a non-hardening thermal compound (MI Blue Goo®) for compression thermal interfaces
	052-0005	Small (1 to 25 Modules)
	052-0006	Large (26 to 100 Modules)
Mounting Materials (Pricing on larger quantities than those specified below is available on request.)		
Solder	3076-01	96°C solder in 5 gram coils
	3077-01	117°C solder in 5 gram coils
Thermal Compound	3079-01	Non-hardening thermal compound (MI Blue Goo®) for compression thermal interfaces (50 grams)
Epoxy	3977-01	Permanent epoxy in individual packages
Thermistors		
Thermistor, Small	2228-07	1.25KΩ ±30%, .014 (.36) dia., .001 (.025) dia. x 5/16 (7.9) platinum lead wires
Thermistor, Medium	2228-03	1.7KΩ ±30%, .043 (1) dia., .004 (.1) dia. x 5/16 (7.9) platinum lead wires
Thermistor, Medium	2228-09	0.2KΩ ±30%, .043 (1) dia., .004 (.1) dia. x 5/16 (7.9) platinum lead wires

Temperature Controller/Power Supplies



MI's new SE5000 Series of three Temperature Controller/ Power Supplies (TC/PS) is designed for temperature control of TECs used with laser diodes, infrared detectors, charge-coupled devices, high-gain amplifiers, and cold plates. This full-featured, linear bipolar power supply offers one of the widest precision temperature control ranges on the market–from -99.9°C to 150°C. For applications requiring lower capacity cooling only, Marlow Industries, Inc., offers the SE1032 Temperature Controller/ Power Supply.

Features of the SE5000 Series TC/PS include:

- Adjustable bipolar DC output current
- Programmable PID control/ramp-to-setpoint control
- High, low, & deviation limit alarms
- Digital readout of output voltage & current
- Simultaneous display of temperature & setpoint
- Available with four thermistor types or thermocouple
- Automatic and manual operating modes
- 115/230 VAC at 60/50Hz for worldwide use

Model No.	General Information
SE5000	Output: 9 volts @ 2 amps to 12 volts @ 1 amp Bench/Rack Model
SE5010	Output: 16 volts @ 6 amps to 21 volts @ 1 amp Bench/Rack Model
SE5020	Output: 16 volts @ 12 amps to 21 volts @ 1 amp Bench/Rack Model
SE1032	Output: 3.5 volts @ 2 amps to 4 volts @.14 amps Bench Model

Literature regarding the SE5000 Series is available from our Customer Service Department.

Ordering Information

Our Customer Service Department and Applications Engineers will assist you in selecting the products that best meet your needs. We can also provide support through local representatives in most international locations. (A list of representatives is enclosed in the pocket flap at right.)

Please contact our corporate offices:

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In the United Kingdom, contact:

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Marlow Industries, Inc.

Thermoelectric Innovation Through Research

Thank you for your interest in Marlow Industries, Inc.'s, products and services. Our success in thermoelectric research, design, and manufacturing has made us the recognized world leader and preferred supplier in thermoelectrics. MI products are routinely specified by designers and engineers for telecommunication, medical, commercial, aerospace, military applications. Typical applications range from cooling charge-coupled devices in the Hubble Space Telescope to cooling laser diodes in fiber optic transmitters.

In addition to our comprehensive standard product line shown in this catalog, MI has extensive experience in the custom design and manufacturing of products ranging from component thermoelectric cooling devices (TECs) to complete assemblies. The catalog also includes information about our new SE5000 Series Temperature Controller/Power Supplies.

MI's vertically integrated capabilities provide minimum turn-around time with optimum cost/performance trade-offs. Whether it is to meet your high performance requirements or simply to provide noise-free and pollution-free cooling or heating for a commercial application where low cost is the prime consideration, we can satisfy your requirement!

For additional information, please feel free to contact our Applications Engineers. Customer Service will be glad to furnish price and delivery. A list of our international representatives is also enclosed.

Marlow Industries, Inc.
Thermoelectric Innovation Through Research

MARK V. MARTIN
Application Engineer

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Marlow Industries, Inc.
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RAYMOND MARLOW
President

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marlow industries, inc.®

Summary of Products & Services

Thermoelectric Applications

- Infrared Detectors
- Charge-Coupled Devices
- Integrated Circuits
- Laser Diodes
- Industrial Assemblies
- Medical Instrumentation
- Military & Aerospace Systems
- Consumer Products
- Low-Level Power Generation
- Miscellaneous Electronic Components

Standard Products

- Thermoelectric Coolers (TECs)
- Temperature Controller/Power Supplies
- Vacuum Enclosures
- Headers
- Heat Sinks
- Thermistors, Thermocouples
- Cold Plate Assemblies
- Mounting Kits
- Solder, Thermal Compound (MI Blue Goo®), Thermal Epoxy

Services

- TEC Selection Assistance
- Design & Manufacturing of Custom TECs & Assemblies
- Product Testing/Burn-in
- Applications Support

Standard TECs

- Vmax: .4 to 15 Volts DC
- Imax: .3 to 14 Amps
- Storage and Operating Temperature to 85°C
- Max Temperature Exposure = 125°C

Single-Stage Modules

- Sizes range from .15 in. sq. (3.8) to 1.5 in. sq. (38.1)
- Square & Rectangular Configurations
- Qmax: .3 to 48 Watts
- ΔTmax Range: 61 to 67°C

Multi-Stage Modules

- Sizes range from a small two-stage module with a .125 in. sq. (3.2) cold side and a .15 in. sq. (3.8) hot side *to* a large six-stage module with a .2 in. sq. (5.1) cold side and a .85 by 1.1 in. (21.6 x 27.9) hot side.
- Qmax: .3 to 14 Watts
- ΔTmax Range: 84°C for a two-stage module to 133°C for a six-stage module.

Special Products

- Custom TECs for special currents, voltages, sizes, configurations, heat pumping capacities, cool-down speeds, strength requirements. Marlow Industries, Inc., (MI) has fabricated special TECs from miniature six- stage (Tc = -100°C) modules with a base of 0.3 in. dia. (7.6) to large multi-stage assemblies pumping 1.5 watts from -90°C.
- Custom Heat Exchanger Assemblies for air or liquid cooling, heating, or temperature control

Note: Dimensions in ( ) are in millimeters.

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Quality Supplier Programs

MI is proud to have earned distinction in quality-directed contracts and procurement, blue ribbon, and certified supplier partnership programs with several major aerospace customers.

Specification

Below is a partial list of specifications to which selected MI products and procedures have been qualified:

- MIL-STD-810A (Shock, Vibration)
- MIL-STD-810B (High Temp., Low Temp., Temp Shock, Vibration)
- Marlow Industries, Inc.,'s Quality Assurance Program has been approved for NASA and Military Hi-Reliability Programs
- MIL-I-45208A (Quality Inspection System)
- MIL-STD-45662 (Calibration Standard)

Contact our Customer Service Department for additional information regarding your specific needs.

MARLOW INDUSTRIES, INC.
International Sales and Support
....

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(Country codes in parentheses)

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Copenhagen NV, Denmark
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TLX 19613
FAX (45) 38 34 22 32

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Equipements Scientifiques S.A.
127 Rue de Buzenal
B.P. No 26 - 92380 Garches
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TLX 204 004 F
FAX (33) 1 47 01 1622

Holland & Belgium
Rodelco
PO Box 6824
4802 HV Breda
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FAX (31) 76-710029

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Regal International, Inc.
273 Closter Dock Road
Closter NJ 07624 USA
TEL (001) 201-784-9428
TLX 642250
FAX (001) 201-784-1805

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POB 23011
Tel Aviv 61 230, Israel
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TLX 342216
FAX (972)-3-5282651

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Milano, Italy
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TLX 350259
FAX (39) 02-48-402-500

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(Yaesu Dai Building), Japan
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Spain
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FAX (34)-3-815-7980

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Gerate + Systeme
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FAX (49) 089-14 90 02 11

marlow industries, inc.

Thermoelectric Innovation Through Research

SE5000 Series

Temperature Controller/ Power Supply

The most sophisticated technology in thermoelectric temperature control from Marlow Industries

SE5000 Series

Temperature Controller/ Power Supply

A fully-programmable, Temperature Controller / Power Supply from Marlow Industries, the leader in thermoelectric products and research

The SE5000 Series Temperature Controller/Power Supply (TC/PS) expands Marlow Industries line of thermoelectric accessories. This linear bipolar constant current power supply is designed for the precision temperature control of all types of thermoelectric cooling devices. With an adjustable DC output power from 18 watts for the SE5000 to 192 watts for the SE5020, the TC/PS provides the versatility required for a variety of applications, including: temperature control of laser diodes, infrared detectors, CCDs, and thermoelectric heat exchangers.

Widest Temperature Control Range Available

The TC/PS provides precision temperature control between -99.9°C and 150.0°C for thermoelectric cooling devices. Temperature control stability is typically ± 0.1°C with calibration accuracy of 0.5°C. Simply stated, the TC/PS provides a wider temperature control range than any other temperature controller/power supply available.

Multi-Option Flexibility

Microprocessor controlled parameters are easy to program and display on three, four-digit LED displays. Front panel controls allow the TC/PS to be operated in two modes: as a constant current power supply in the manual mode or as a temperature controller in the automatic mode. RS-232-C or RS-422-A interfaces are available for remote computer control. Read-only and hidden parameter configurations also prevent unauthorized tampering of front panel controls. The TC/PS can be used with four thermistor types or a Type T thermocouple, according to operator needs.

The SE5000 Series TC/PS offers:

- *The widest precision temperature control range on the market—from -99.9°C to 150°C*
- *Adjustable bipolar DC output current*
- *Simultaneous display of temperature and setpoint*
- *Remote programming and readout through optional RS-232-C or RS-422-A interfaces*
- *Programmable PID control / ramp-to-setpoint control*

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Temperature Sensors Selection Table

Sensor & Dimensions	Uses	Temperature Range	Accuracy
tH1 Bead Thermistor Bead, .022" dia x .100" l (.56 mm dia x 2.5 mm l) Lead wire, .002" dia x 1" l (5 microns dia x 25 mm l)	Top-of-the-line thermistor for use when accuracy and interchangeability are critical. Can be used on all Marlow Industries, Inc., thermoelectric cooling devices and cold plates.	-99.9° C to 100° C	-80° C to 100° C, ± 1° C -80° C to -100° C, ± 1.5° C
tH2 Bead Thermistor Bead, .014" dia (.36 mm dia) Lead wire, .001" dia x .3" l (25 microns dia x 8 mm l)	Versatile thermistor offering good accuracy when used to stabilize at 25° C, but poor accuracy at extreme temperatures. Small lead wires minimize conductive heat loads but require special handling care.	-99.9° C to 100° C	-100° C to -25° C, ± 6.5° C -25° C to 50° C, ± 3.5° C @ 25° C, ± 1.5° C 50° C to 100° C, ± 6.7° C
tH3 Bead Thermistor Bead, .095" dia (2.4 mm dia) Lead wire, .008" dia x 1.5" l (.2 mm dia x 38 mm l)	Low-cost thermistor with high accuracy and interchangeability. Large bead and leads allow easier handling but limit use to large thermoelectric cooling devices and cold plates.	-70° C to 150° C	-70° C to -30° C, ± 1.0° C -30° C to 110° C, ± .5° C 110° C to 150° C, ± 1.0° C
tH4 Chip Thermistor Chip configuration .49" w x .1" l x .022" h (12.4 mm w x 2.5 mm l x .56 mm h)	Low-cost thermistor for use when moderate accuracy and interchangeability are needed. Large size limits use on small thermoelectric cooling devices. Lead wires not included.	-55° C to 150° C	-55° C to 40° C, ± 1.8° C @ 25° C, ± 1.3° C 40° C to 80° C, ± 3.6° C 80° C to 150° C, ± 7.8° C
t tc Type T Thermocouple (Copper/Constantan) .003" dia x 12" l, uninsulated (76 microns dia x 30.5 cm l)	Low-cost thermocouple offering high accuracy, uninsulated leads. Requires thermocouple extension wire and isothermal connector block if third metal conductor is used in either lead.	-99.9° C to 150° C	-100° C to -66° C, ± 1.5° C -66° C to 130° C, ± 1.0° C 130° C to 150° C, ± 1.1° C

SE5000 Series Standard Equipment

- AC power cord, 7-ft (2.13-m) long
- DC output cable, 8-ft (2.44-m) long
- Operation manual
- Type T thermocouple (copper/constantan), 12-in (30.5-cm) long
- Thermocouple cable, 8-ft (2.44-m) long

Interface Options (specify when ordering)

- RS-232-C remote computer control interface w/9- or 25- pin connector, 12-ft. (3.05-m) long cable
- RS-422-A remote computer control interface w/25-pin connector, 12-ft (3.05-m) long cable

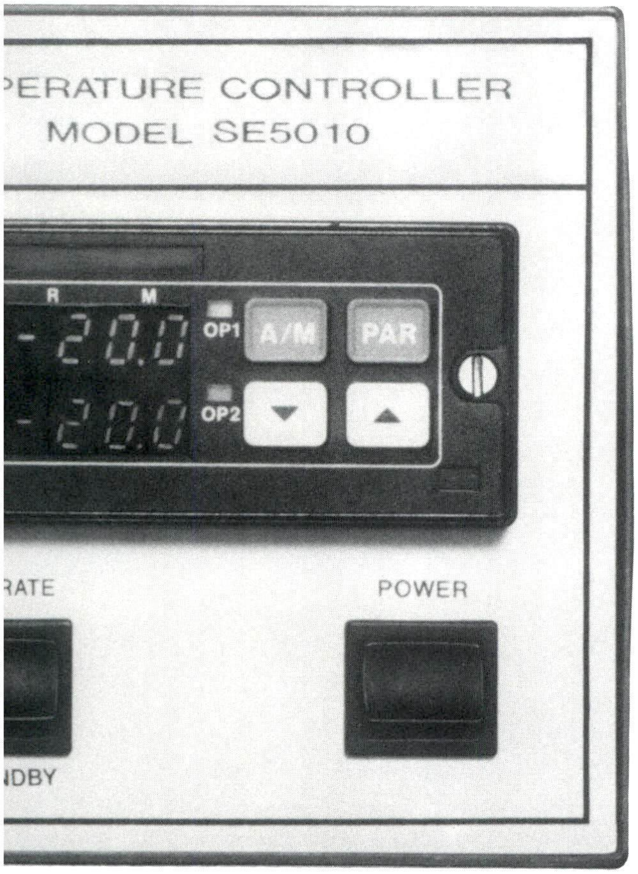
Accessories (specify when ordering)

- Single-rack mounting kit
- Dual-rack mounting kit
- Various bead and chip thermistors
- Type T thermocouple (copper/constantan)

Specifications	All Models
Temperature Control Range	-99.9° C to 150° C
Control Stability	± 0.1° C (typical)
Ramp Rate Range	0.01°/min. to 99.99°/min.
Control Mode	PID & PID ramp-to-setpoint
Linearization Accuracy	0.1° C for thermistor, 0.2° C for thermocouple
Calibration Accuracy	0.5° C
Power Supply Output Stage	Linear bipolar
Ripple and Noise	Less than 10 mA rms
Voltage/Current Readout Accuracy	1% of reading plus two digits
Operating Temperature	0° C to 50° C
Storage Temperature	-10° C to 50° C
AC Input Power	104-125/208-250 Vac, 48-62 Hz

Specifications	SE5000	SE5010	SE5020
Output Power	18 W max	96 W max	192 W max
Output Current	0 to ± 2 Adc	0 to ± 6 Adc	0 to ± 12 Adc
Output Voltage Compliance	0 to ± 9 Vdc at 2 A to ± 12 Vdc at 1 A	0 to ± 16 Vdc at 6 A, to ± 21 Vdc at 1 A	0 to ± 16 Vdc at 12A, to ± 21 Vdc at 1 A
115 VAC Input Current	0.6 A max	2.4 A max	4.8 A max
230 VAC Input Current	0.3 A max	1.2 A max	2.4 A max
Dimensions	5.22" h x 8.38" w x 10.6" d (13.3 cm h x 21.3 cm w x 26.92 cm d)	5.22" h x 8.38" w x 16.0" d (13.3 cm h x 21.3 cm w x 40.6 cm d)	5.22" h x 8.38" w x 16.0" d (13.3 cm h x 21.3 cm w x 40.6 cm d)
Weight	10 lbs (4.55 kg)	20 lbs (9.09 kg)	30 lbs (13.64 kg)

Specifications subject to change without notice.



- *Operation with two different sensor types—thermistor or thermocouple*
- *High, low, and deviation limit alarms*
- *Automatic and manual operating modes*
- *Digital readout of output voltage and output current*
- *Operable on 115/230 VAC at 60/50 Hz for worldwide use*

PID Control

The operator may select programmable Proportional Integral Derivative (PID) control with or without ramp-to-setpoint. PID control minimizes overshoot, eliminates steady-state error, and allows the fastest response from one setpoint to another. PID control with ramp-to-setpoint allows the operator to control the rate of temperature change.

Safety Features

Automatic shutdown for an open or shorted thermistor or an open thermocouple prevents damage to the thermoelectric cooler. High, low, or deviation limit alarms alert the operator of any deviation from programmed limits.

Digital Displays

Digital displays allow the operator to check the measured temperature, setpoint temperature, and the voltage/current at a glance. Temperature readings may be programmed to display in Celsius or Fahrenheit. A red/green bar graph display indicates in tenths of a unit (based on current limit) whether the controller is operating in the heating or cooling mode.

Operator Adaptability

The TC/PS has a tilt-up stand for bench-top use. It may also be ordered with a rack mount adapter option and for installation in a standard EIA 19" cabinet. Operable on 115/230 VAC at 60/50 Hz, the TC/PS can be used worldwide. The linear output minimizes electrical noise to less than 10 mA rms. Recommended operating temperature is 0°C to 50°C with storage between -10°C and 50°C.

marlow industries, inc.

Thermoelectric Innovation Through Research

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Marlow Industries' Quality Policy

For every product or service we provide, we will meet or exceed the customers' requirements, without exception. Our standard of performance is:

Do it right today, better tomorrow.

European Branch Office/ Technical Support Center

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FAX: 0737-833140

Representatives

(Country codes in parentheses)

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France Photon Science Instruments • TEL (33)-1-60-11-79-75 • TELEX 600301 • FAX (33-)1-60-11-76-02
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ESTIMATING HEAT LOADS FOR THERMOELECTRIC COOLERS

Before beginning the Thermoelectric Cooler (TEC) selection process, the cooling requirements must be defined. This includes determining the amount of heat to be pumped. The performance of the cooler is inversely proportional to the total heat load. By reducing the heat load, the cooler will be able to achieve colder temperatures or it will require less power to reach the same cooling level. The following describes the techniques used to estimate active and passive heat loads, and applies only to steady state heat loads. If the heat load is of a transient nature or involves more complex factors such as air or fluid flow, we suggest that you call one of our applications engineers for assistance.

HEAT LOAD

The heat load may consist of two types; active or passive, or a combination of the two. An active load is the power which is dissipated by the device being cooled. It is generally equal to the input power to the device. Passive heat loads are parasitic in nature and may consist of radiation, convection or conduction.

ACTIVE HEAT LOAD

The general equation for active heat load power dissipation is:

$$Q_{active} = V^2/R = VI = I^2R$$

where:

Q_{active} = active heat load (watts)
V = voltage applied to the device being cooled (volts)
R = device resistance (ohms)
I = current through the device (amps).

For example, a typical lead selenide (PbSe) infrared detector is operated at a bias voltage of 50 volts and a resistance of 0.5 megohms. The active load therefore, is .005 watts.

RADIATION

When two objects at different temperatures come within proximity of each other, heat is exchanged between them. This occurs through electromagnetic radiation which is emitted from one object and reaches the other object. The hot object will experience a net heat loss and the cold object a net heat gain as a result of the temperature difference. This is called thermal radiation.

Radiation heat loads are usually considered insignificant when the system is operated in a gaseous environment because the other passive heat loads are much greater in magnitude. Radiation loading is usually significant in systems with small active loads, and large temperature differences, especially when operating in a vacuum environment.

The fundamental equation which describes radiation loading is:

$$Q_{rad} = F\,\varepsilon\,\sigma\,A\,(T_{amb}^4 - T_c^4)$$

where:

Q_{rad} = radiation heat load (watts)
F = Shape factor (worst case value = 1)
ε = emissivity (worst case value = 1)
σ = Stefan-Boltzman constant (5.667×10^{-8} W/m²K²)
A = area of cooled surface (m²)
T_{amb} = Ambient temperature (Kelvin)
Tc = TEC cold ceramic temperature (Kelvin).

Example Calculation: A Charge Coupled Device is being cooled from an ambient temperature of 27°C to -50°C.

The known parameters are:

1. Detector surface area - (includes 4 edges + top surface)

   $A = 8.54 \times 10^{-4}$ m²

2. T_c = -50°C = 223K

3. T_{amb} = 27°C = 300K

4. for a worst case example, or if no information is available:

   $F = \varepsilon = 1.$

From the equation above:

Q_{rad} = (1) (1) (5.66×10^{-8} w/m²K⁴) (8.45×10^{-4} m²) $[(300K)^4 - (223\,K)^4]$

= 0.270 watts.

CONVECTION

When a fluid (in this case, a gas) flows over an object while the temperatures of the gas and the object are different, heat transfer takes place. The amount of heat transfer may vary depending on the rate at which the fluid is flowing across the object. Convective heat loads on TEC's are generally a result of *natural* (or free) convection. This occurs when the flow of a gas is not artificially induced with a fan or a pump, but rather from the density difference in the gas caused by the temperature difference between the object being cooled and the gas.

The convective loading on a system is a function of the exposed area, and the difference in temperature between this area and the surrounding gas. Convective loading is usually most significant in systems operating in a gaseous environment with small active loads, or large temperature differences.

The fundamental equation which describes convective loading is:

$$Q_{conv} = h\ A\ (T_{air} - T_c)$$

where:

Q_{conv} = convective heat load (watts)
h = convective heat transfer coefficient (w/m²°C) (typical value 21.7 for air at 1 atm.)
A = exposed surface area (m²)
T_{air} = temperature of surrounding air (°C)
T_c = temperature of cold surface (°C).

Example caluclation: A 0.01 square meter plate is being cooled from 25°C to 5°C. The top and four sides are exposed surfaces. The plate is 0.006 meters thick.

From the Convection equation:

$$Q_{conv} = (21.7\ w/m^2{}^\circ C)\ (0.0124\ m^2)\ (25^\circ C - 5^\circ C)$$

$$= \underline{5.4\ watts.}$$

It is very important to avoid allowing condensation to form when cooling below the dew point. This problem may be avoided by enclosing the cooling system in a dry gas or a vacuum environment.

CONDUCTION

Conductive heat transfer occurs when energy exchange takes place by direct impact of molecules from a high temperature region to a low temperature region.

Conductive heat loading on a system may occur through lead wires, mounting screws etc., which form a thermal path from the device being cooled to the heat sink or ambient environment.

The fundamental equation which describes conductive loading is:

$$Q_{cond} = \frac{k\ A}{L}\ \Delta T$$

where:

Q_{cond} = conductive heat load (watts)
k = thermal conductivity of the material (w/m°C)
A = cross-sectional area of the material (m²)
L = length of the heat path (m)
ΔT = temperature difference across the heat path (°C) (usually ambient or heat sink temperature minus cold side temperature).

TABLE 1. Thermal Conductivities of Various Wire Material

Material	Thermal Conductivity (w/m°C)
Aluminum	205
Copper	386
Gold	315
Platinum (90%) Iridium (10%)	31.1
Platinum	70.9
Manganin	22.2

Example Calculation: A TEC is used as a black body reference. A temperature sensor is attached to the cold surface of the TEC. It has two platinum leads which have a diameter of 25µm and are 12 mm long. These leads are attached to pins on the heat sink. The cold plate is at -20°C while the heat sink is at 30°C.

The known parameters are:

1. $k = 70.9$ w/m°C, from Table 1
2. $\Delta T = [30 - (-20)] = 50^\circ C$
3. $A = \pi d^2/4 = \pi\ (25 \mu m)^2 / 4$
   $= 4.91 \times 10^{-10}\ m^2$
   $A(2\ wires) = (2)\ (4.91 \times 10^{-10}\ m^2) = 9.82 \times 10^{-10}\ m^2$
4. $x = 12mm = .012m.$

From the equation above:

$$Q_{cond} = \frac{[(70.9\ w/m^\circ C)(9.82 \times 10^{-10}\ m^2)]\ \ (50^\circ C)}{(.012m)}$$

$$= \underline{0.0003\ watts.}$$

Since the conductive load is inversely proportional to the length of the wire, the conductive load can be reduced by using longer wires.

*Heat loads may consist of one or more of four modes: **active, radiation, convection or conduction.** By utilizing these equations you can estimate your heat loads. The numbers can be used in conjunction with the "Thermoelectric Cooler Selection Guide" to select a suitable TEC for your application.*

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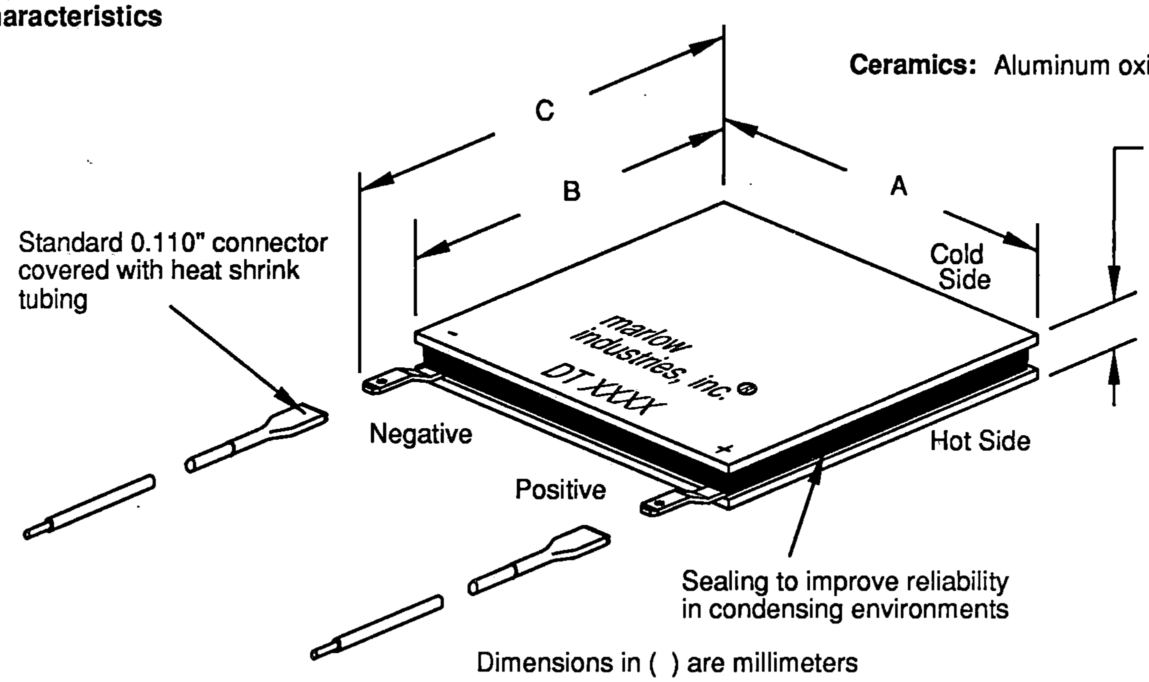
DuraTEC™ Thermoelectric Cooler

Mechanical Characteristics



Ceramics: Aluminum oxide (AC)

Dimensions in ( ) are millimeters

Typical Performance Values

	DT MAX DRY N2	QMAX (WATTS)	IMAX (AMPS)	VMAX (VOLTS)	CERAMIC WIDTH A IN (MM)		CERAMIC LENGTH B IN (MM)		TOTAL LENGTH C IN (MM)		HEIGHT D IN (MM)	
DT1062	62	12.5	5.5	3.60	0.787	20.0	0.787	20.0	1.09	27.7	0.159	4.04
DT1082	62	17.1	7.5	3.59	0.787	20.0	0.787	20.0	1.09	27.7	0.141	3.58
DT1132	61	29.8	13.2	3.62	1.181	30.0	1.181	30.0	1.48	37.6	0.164	4.17
DT1043	62	18.6	3.6	8.20	0.906	23.0	0.906	23.0	1.20	30.5	0.144	3.66
DT1063	62	28.5	5.5	8.24	1.181	30.0	1.181	30.0	1.46	37.1	0.159	4.04
DT1083	63	39.2	7.5	8.21	1.181	30.0	1.181	30.0	1.46	37.1	0.141	3.58
DT1133	63	67.0	13.0	7.90	1.732	44.0	1.732	44.0	2.02	51.3	0.164	4.17
DT1039	63	27.8	3.0	14.80	1.181	30.0	1.181	30.0	1.47	37.3	0.144	3.66
DT1049	64	33.3	3.6	14.80	1.181	30.0	1.181	30.0	1.47	37.3	0.144	3.66
DT1069	64	51.5	5.5	15.10	1.575	40.0	1.575	40.0	1.83	46.5	0.159	4.04
DT1089	64	70.0	7.5	14.80	1.575	40.0	1.575	40.0	1.83	46.5	0.141	3.58

DuraTEC™ Features

The DuraTEC™ series of thermoelectric coolers include:

- Sealing to improve reliability in condensing environments
- Quick and reliable standard spade lug connections
- The ability to withstand higher assembly processing temperature for short periods of time (<150 C)
- Dual Ni diffusion barriers for improved reliability

DuraTEC™ Thermoelectric Cooler

Model Number

The complete model number consists of the base model number followed by a two digit dash number designating the lead wire length and lapping options.

LEAD WIRES	CERAMIC SURFACE
-0X No lead wires	-X3 Lapped +/-0.005"(.125mm)
-1X 4"(10.2cm) lead wires	-X4 Lapped +/-0.001"(.025mm)
-2X 8"(20.3cm) lead wires	

For example, the standard version of this DuraTEC™ is a DT1XXX-03 which does not include lead wires and is lapped to +/- 0.005"(0.127mm). Standard 0.110" female spade connectors are used to connect directly to the DuraTEC™ and should be considered when designing your systems electrical connections.

Storage, Installation, & Operation Cautions

For maximum reliability, storage and operation below 85 °C is recommended.. Excessive power cycling and powering through thermostatic (on/off) control is not recommended. Consult Marlow Industries' Thermoelectric Installation Guide or Reliability Report for more details. For additional information, please contact one of our application engineers for technical support.

Ordering Information

Please contact one of our Customer Service Representatives or Application Engineers for assistance in identifying or ordering the cooling solution that best meets your requirements. If you are located outside the North American continent or the United Kingdom, please contact our home office for the local representatives name and address nearest you.

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Marlow Industries Quality Policy

For every product or service we provide, we will meet or exceed the customers' requirements, without exception. Our standard of performance is: Do It Right Today, Better Tomorrow.

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